SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1721.—Vol. XXXVIII. LONDON, SATURDAY, AUGUST 15, 1868. {STAMPED .. SIXPENCE. UNSTAMPED. FIVEPENCE.

SOUTH WALES INSTITUTE OF ENGINEERS.

The general meeting of members was held at Newport, on Aug. 6.

Mr. R. BEDLINGTON (President of the Society) in the chair.

Among the members present we observed—Mr. J. Brogden, F.G.S., Bridgend; Mr. Thomas Brown Foster, F.G.S., Cardiff; Mr. M. Bates, Merthyr Tydvil; Mr. William Bevan, Tredegar Ironworks; Mr. E. Brigden, Dowlais; Mr. Thomas Curnew, Pontypridd; Mr. Thomas Ellis, jun., Blaenavon Ironworks; Mr. Christopher James, Aberdare; Mr. John James, Ebbw Vale Ironworks; Mr. Benjamin Jones, Rhymney Ironworks; Mr. David Joseph, Ely Rise, Cardiff; Mr. Conyers Kirby, Newport; Mr. Morgan Morgans, Bristol; Mr. James Murphy, Newport; Mr. G. Cope Pearce, Cyfarthfa Ironworks; Mr. Edwin Richards, Tredegar Ironworks; Mr. David Thomas, Rhymney Ironworks; Mr. J. H. Edge (Edge and Son); Mr. J. James, Newbridge, &c.

The CHAIRMAN said at their last council meeting it was decided that the next meeting should be held at Newport, on the present date, under the impression that it would have suited the members generally, but they were deprived of the attendance that day of several of their members, on account of the Assizes. They did not know the day would have been inconvenient, otherwise the council would have arranged for a postponement, but the time was too short to enable them to give notice to the members; consequently, he was afraid they would have a very scanty attendance.

Mr. BRIGDEN (the secretary) read the minutes of the last meeting, and reported that the gentlemen whose names are appended had been admitted new members:—Mr. David Evans, colliery manager, Cwmbach Colliery, Aberdare; Mr. John Simpson, Rhoes, Llantrissant Colliery, Caerphilly; Mr. Joseph Kay, mineral agent, Blaenavon Ironworks; Mr. Herbert Rake, marine engineer, Newport; Mr. E. Daniel, civil engineer, Christina-street, Swansea; Mr. W. H. M. Phillips, mineral agent, Edgehill Mines, Mitchel Dean; Mr. David Rees, colliery proprietor, Maes-y-ffynon, Aberdare; Mr. William Gray, colliery manager, Taibach; Mr. Wm. Bailey, engineer, Frampton Cotterell.—Graduate: Mr. J. M. Johnson, mining engineer, Cinderford.

Mr. W. T. Lewis was nominated Vice-President, and Mr. John Cox was nominated for re-election. Messrs. C. James, D. Joseph, H. M. Maynard, D. Thomas, and W. Richards were nominated for re-election as members of the council; and Mr. Truron was nominated in the place of Mr. W. T. Lewis, who had been nominated Vice-President. Mr. Brigden was re-appointed secretary.

Mr. J. MURPHY objected, on principle, to the re-election of officers time after time, which excluded excellent gentlemen who were well qualified from holding office.——The PRESIDENT said the matter had been considered by the council, whose object was to have the several districts represented at the board. It was open to any member to nominate gentlemen for office.

THE PRESIDENT'S ADDRESS.

The PRESIDENT said he had to thank them for the high honour they had done him in electing him President of the South Wales Institute of Engineers, an honour which he fully appreciated, and which he would do his utmost to deserve. They would be glad to know the Institute was progressing, both as regarded numbers and funds. The number of members was at the highest point it had ever reached, whilst their funds had reached a fair amount, and he hoped they would soon be in a position of having 1000*l.* in hand, when it would be for the members to say what they should do with that amount. He, for one, would consider it well laid out in erecting some central building which would serve as a place of meeting, and also as a museum of geological specimens of all kinds. But that was a matter which would come on in due course. The Institute was founded in October, 1857, and during that ten years he thought a fair amount of work had been done. A great number of papers had been read on a variety of subjects, and had been thoroughly discussed. They had had papers on the South Wales district generally, and some parts had been especially described, as the Port of Cardiff and the Aberdare coal field, the Port of Newport and its coal field, the Caerphilly district, the Tillery seams, and the deep measures of South Wales. But it would be desirable to have papers on the Llantrissant, Rhondda, and Neath districts; and there might be other matters which required treatment, on all which they desired papers. Naturally, they had paid attention to their own districts, but they had been anxious for all the information they could get on other districts in England. Accordingly, they had had papers on mining in Lancashire, on the districts of Leicestershire, South Staffordshire, and East Worcestershire; the thin seams of Somersetshire had been described. They had had a paper on a portion of the Somersetshire coal field, and one on the Copper Sandstone of Alderley Edge, in Cheshire. They had also had some papers in respect to Scotland and Ireland, so that other districts had received attention as well as their own. But they would find that some of the members had given them but little aid in the way of papers, and he put it to their conscience whether they had done their duty by the Institute in not doing so? They would remember that some little time ago there was a panic in the country as to the duration of the coal fields, when it was thought that they were rapidly coming to an end. Several papers had then been prepared as to the duration of the coal in this country, and an attempt had been made to get the probable duration of the South Wales coal field. He believed there was diversity of opinion on that subject, and he invited further papers. Having coal in enormous quanties, as he doubted not they had, it was important it should be worked on the best system. They had had papers on the long work system, and the single and double stall system, and if any member thought those subjects had not been properly discussed, they would be glad of further papers. Long work had made great progress in this district, far more so than he should have supposed likely in so short a time. The principal inducement to carry out that system was that they produced a large amount of marketable coal from a given area, in the best condition, and they had great improvements in ventilation. But that system had its disadvantages as well, and they wished further information from gentlemen who had adopted that system. They had had no complete paper on sinking pits, but they had had a paper "On the Difficulties Encountered through Sinking through a Bed of Quicksand, and the Tubbing of Shafts," and he asked the members whether, in their wells, they had adopted tubbing as much as was desirable? Then they had had a paper on the sinking of shafts by machinery, by a gentleman who had great experience in the sinking of wells for water. Of course the diameter of those was not very great, but he understood that in France and Belgium that system had been applied to shafts of considerable diameter. He asked for further information. One of the difficulties of mining had been what to do with the small coal. They had now before the Institute a paper "On Patent Fuel," and he thought their closest attention would be required to see if small coal could not be used in the production of patent fuel. But it would be necessary for the manufacture to be carried on very economically, or the price of that would nearly approach that of large coal. Machinery for winding and pumping had been treated, as also the subject of underground traction; but he conceived that further information was required. He thought it would be essential for them to pay greater attention to underground traction by machinery, the question of superseding horse labour being of growing importance, owing to the increasing magnitude of the collieries. Whether the machinery should consist of tail-ropes, endless ropes, or endless chains, was, of course, a subject of debate, and he invited information. Then a very important question was that of coal-cutting by machinery, in which he did not think they had yet been successful. There were a variety of machines which would do a given work; but they must consider that that work had hitherto been principally what was called the holing of coal, which was but a small portion of the colliers' work. A very important question in connection with winding had been the application of a powerful break, and they had had two papers, but further information was desirable, the subject being of vast importance. He was sorry to see by the Blue Book, published annually in the shape of the Inspectors' Reports, that while there were a great number of cases of overwinding in England, he was happy to say that Wales had been pretty free hitherto from such accidents. Then, owing, perhaps, to the great depths to which pits reached, and the great pressure causing a great amount of gas to exude from the veins, and making the collieries more explosive, ventilation was one of the most important subjects to which they could apply themselves. It was, therefore, proper to have before them the question of machinery as applied to ventilation. This had been done in a paper "On Mechanical Ventilation," which had been several times discussed, and would be still further so. They were told that the furnace was to be superseded by mechanical ventilation. If that were so, they should go fully into the merits of the various modes of ventilation, as Guibal's fan, which was before them in Mr. Pearce's paper. He hoped, also, they would have brought forward Lemielle's, Struvé's aerometer, and Nixon's ventilation, and that they would have valuable information, and that without prejudice the members would be prepared to adopt the best modes. An important paper, which had evoked considerable discussion, had been contributed by a member on the subject of accidents in mines. It had been stated that South Wales had a greater amount of accidents than they had from the same amount of work in the North of England. He thought it desirable to re-open the subject, because he did not consider that a calculation should be based on the number of tons per accident, but the percentage of life lost according to the number of men employed. Curiously enough, they had had only one paper on the subject of safety-lamps, and further information was invited. The question of the best result to be derived from the use of the coal needed ventilation, because, as they were told by chemists, they did not now gain the best results from the fuel used. The subject had not been lost sight of by the Institute, but he thought they would agree with him that there was not sufficient economy displayed in the use of coal in Wales, and therefore it was desirable the subject should be further treated. Their engineers should too, he thought, give attention to the form of boilers, and the better consumption of smoke. Passing from collieries to ironworks, they had had but very few papers upon that important manufacture, and that was very curious, considering the number of ironworks represented in that Institute. They had had three papers on the blast-furnace. In connection with that, it was well known that in the North of England the altitude of the furnace had of late years been made much greater than in Wales; and one of the ironmasters in the Lancashire district had informed him that they derived great benefit from the increased height—that there was great economy in the consumption of fuel. If that were the case, they invited additional information. Then, they had papers on the rolling of iron, and on the blooming mill. They had also had papers on the manufacture of steel; but as there were extensive works in the district, the members generally would be glad if gentlemen connected with the works would furnish papers on the manufacture of steel in Wales. They had also had papers on tin-plates, and on the structure of iron, and some others of less importance. The beautiful structure of Crumlin Viaduct had been ably described by Mr. Maynard, who had also supplied a paper on multiple drilling as applied to the drilling of the plates used at that bridge. The consumption of bricks at the ironworks had been great, and they had had papers on the manfacture of bricks. One advocated the utilising of ironstone tips, which had been used for the manufacture of common bricks. Another paper advocated the manufacture of stone bricks. Attempts had been made to utilise furnace slags, but hitherto not with much success. Although railways were the principal means for the transit of their minerals they had not, it was curious to say, had a single paper thereon. The nearest approach was a paper on the manufacture of railway wheels, and it would be gratifying to know if there were any suggestions of improvement in railways. So desirous had the members been that there should not be anything in the way of refuse not utilised, that it had been suggested that iron pyrites or coal brasses should be used, and a paper had been written on the subject. When he mentioned that only one paper had been contributed on any remarkable appearance in collieries, he stated a very remarkable fact. One paper had been given them, informing them of a metalliferous vein of lead passing through a coal bed; but he thought gentlemen were not so unobservant underground but that they might have further papers on that to give. Well, as he had stated, they had increased in numbers, but they had also to lament the death of three members during the past year—Mr. John Williams, Letty Shenkin; Mr. Gould, Cinderford; and Mr. W. Moyle, formerly engineer of the Rhymney Ironworks. In conclusion, the President referred to some slight changes in the mode of conducting the business, and resumed his seat amid loud cheers.

Mr. J. MURPHY eulogised the address of the President, and expressed himself pleased with the suggestion of a building for the purposes of the Institute. He expressed his willingness to lay before the meeting the plan of a tram on an improved principle, as he thought, for carrying coal underground. He aimed at reducing the weight of the trams, which he believed would result in profit, and he thought also that Mr. Brogden had an idea of writing a paper on the subject. Mr. Murphy then suggested that in future they should give honorary premiums of books to writers of papers, and he trusted that would in future engage the attention of the committee. (Hear, hear.)

MECHANICAL VENTILATION.

The discussion on Mr. Cope Pearce's paper "On Mechanical Ventilation," commenced at the April meeting, was then resumed.

Mr. BATES proceeded to answer the question put at the last meeting as to the distance the air travelled at the Gethin Pit, where Guibal's fan was used. They had six different splits, the total distance of the whole giving an average for each of 3430 yards, through which the wind travelled. Another question had been asked as to the quantity of wind that travelled in the workings of the mine compared with the quantity that went through the fan. When they had 100,800 cubic feet of air passing through the fan there was in the main returns 95,988 feet, and passing through the six splits 77,268. Other experiments had been tried with similar results. Mr. Bassett had enquired how much per hour the quantity of wind was reduced for a certain number of hours after the machine stopped. He had measured for six consecutive hours. The first hour after the fan had stopped they had 21,120 cubic feet, the second hour 17,280, and at that figure it continued to the end of the sixth hour, and he attributed that 17,280 feet to natural ventilation. At their next meeting Mr. Lewis would probably be able to give them the result of experiments as to the temperature of the upcast and downcast shafts. During the experiments they had burned 7 tons of coal in 24 hours—6 tons of small coal and 1 ton of large. Taking the first experiment, 100,800 cubic feet, that gave 8545 cubic feet per 1 lb. of coal.

The PRESIDENT said the first point was to get a machine which would give the largest amount of ventilation, and then would come, secondly, the question of economy. He thought mechanical ventilation was the cheapest, because they could use less coal and of commoner quality than was required for the furnace; but he thought they would not adopt mechanical ventilation unless they got a vastly increased amount of air.

Mr. BATES said the results of their experiments with the fan were now before the Institute, and it was for some gentleman to furnish them with furnace experiments, and compare the two.

The PRESIDENT remarked that when Mr. Bates had previously stated that the machine produced 100,000 to 120,000 cubic feet per minute, he was met by the question—Well, that is a large amount, but it is not better than the furnaces are doing; and we want to know how far that air has to travel before we can know if the machine is doing good work—whether it travels one or two miles? Mr. Bates held that it made no difference; he gave them the result of the resistance, whether it were long or short. If it were a short distance, and they had a high water-gauge, it told against themselves, because very likely they had bad windways. But if they measured the total resistance by the water-gauge in both instances he could not see that it mattered about the distance.

Mr. BROGDEN thought that it was important that the registers should be taken on the same basis, that they might be correctly compared, because he found it difficult to compare the returns of various gentlemen. The information would be much more valuable if it embraced not only the quantity of coal and the economic value, but the height of the shaft, the pressure of the water gauge at the bottom, and other things which necessarily affected the working of the fan. In their case they had found the advantage of the fan, as being more economical than the furnace. But another important point was that gentlemen should give the size of the blade, upon which ventilation much depended.——The PRESIDENT said he thought Mr. Wilkinson would be able to give some information, the result of experiments with the fan at Lower Duffryn, at the next meeting.

Mr, M. MORGANS enquired what was the power given out by the engine to produce 100,800 cubic feet?—Mr. BATES said in the experiments to which he had just referred, with 46 revolutions of the fan there were 12 lbs. of steam on the piston, which made the horse-power of the engine 37·80, or nearly 38, with that they got 100,800 cubic feet. The water-gauge was 1¼ in., the horse-power in the air 23·82, which gave a decimal percentage of useful quality of 63.

Mr. MORGANS thought, as to the 17,000 cubic feet which Mr. Bates put down to natural ventilation, it would be very satisfactory if the natural ventilation were tested before the fan was set to work.——The PRESIDENT remarked that the important point was to know whether colliers would have ample time to escape supposing the machine stopped. That was why it had been deemed necessary to make experiments as to the result of a stoppage. A great many who adopted the furnace were afraid of the effect of a sudden stoppage of the machinery, whereas with the furnace if the fire were put out they would have a heated column for several hours.

The PRESIDENT in reply to some remarks by Mr. Morgans, said one of the advantages of the fan over Struvé's ventilator was its continuous action. It did not depend upon up and down strokes, such as Mr. Morgans had described, but the fan ran equally throughout the time, and so gave equal ventilation throughout.——Mr. MORGANS did not dispute that. He had only meant to say that with Struvé's ventilation, at Risca, which he had seen at the time of the explosion, was of an impulsive character, in consequence of its reciprocal motion.——After some further conversational remarks, the discussion was adjourned.

PATENT FUEL.

The PRESIDENT said the next business was the resumption of the discussion on Mr. Bassett's paper "On Patent Fuel." Mr. Bassett

was unable to be present. [An abstract of this paper was published in the Supplement to the *Mining Journal* of April 25.]

Mr. Brogden thought that to compare the relative merits of different processes they should have the results given by engines from patent fuel manufactured by Barker's process and that manufactured by other means, and a comparative statement of the results of that manufactured from the steam coal of the district and that manufactured from the bituminous coal. He had made enquiries in districts of France where patent fuel was made, and he found that that which was intended for locomotive purposes was usually made with pitch, and so on, thereby at once precluding its use for household purposes. The bituminous coal was acknowledged to be more suitable for household purposes, and Barker's patent in London had been applied more to that, perhaps, than anything else, and perhaps for household purposes it might be necessary to adopt it to a certain extent where the others could not he applied. A knowledge of the relative cost of manufacture would be also interesting.

The President: Have you adopted any particular mode of manufacture?——Mr. Brogden answered in the negative. They were now discussing the question as to which was best. They had manufactured some under Barker's patent, and he had stated several difficulties to Mr. Bassett, who thought they could be got rid of—such as the influence of the weather on exportation; and as they had always understood yet, Mr. Barker's did not answer so well as the others under exposure to weather.

The President: What do you allude to?——Mr. Brogden: I am not speaking of patents, but the usual manner of manufacture at Swansea—the pitch process. Mr. Bassett thinks it can be made to do so.——The discussion was then adjourned.

DAVIES'S SELF-ACTING STEAM STRIKER.

BY MR. D. DAVIES, OF CRUMLIN.

The object of this machine is to avoid the loss of time by strikers waiting for heats. Many of the machines have now been in constant use for nearly three years, and have given satisfactory results. The machine is so constructed that it will strike at any angle inclined to the face of the anvil, from the vertical to the horizontal direction on either side, and equally effective in all directions. It will work on any number of anvils arranged in a circle around the hammer. The machine is well adapted for all kinds of light forgings required in bridge, ship, and engine work. It is entirely under the control of the smith, who can regulate by hand or foot the direction, force, and rapidity of its blows. The space occupied by the striker is comparatively small, being about one-fourth of that required for hand strikers when working on the same number of anvils. The striker can be worked either by steam, compressed air, or water-power. It will work upon any height up to 6 ft. from the floor of the smith's shop, and as it can be raised through the same height in a few seconds by opening a hydraulic cock, it can be readily adapted for striking perfectly level blows on the anvil. The striker can forge shafts, bolts, &c., round without the use of swages.

The steam-striker consists essentially of a hammer worked by a steam-cylinder, either direct or through the medium of an oscillating lever. The steam-cylinder is fixed or cast inside of a horizontal cylinder. The two cylinders may have their axes inclined at an angle to each other, or they may be parallel. The horizontal cylinder is made so as to be capable of revolving in bearings, carrying with it the steam-cylinder and hammer. The hammer by this means is able to strike blows in any desired direction. The horizontal cylinder may be turned round and its bearings by hand, steam, or hydraulic power. The steam-chest is at right angles to the axis of the steam-cylinder, and in it works a cylindrical double disc equilibrium valve, connected by a spindle direct with an internal link, to which the writer invites special attention. The link has an irregular-shaped oval hole, in which a stud projecting from the piston-rod works; the upward and downward movement of the piston producing a lateral reciprocating motion in the link, by forcing the stud against the inclined face of the oval hole, moving the link with the valve attached, and alternately admitting and releasing the steam to the ports of the cylinder. When required the cylinder is fitted with sliding-plates at each end, for regulating the length of stroke, and varying the force of blows to suit the size and nature of the forgings under operation. In addition to being worked by the piston-stud, the link can be worked by hand, so as to admit steam to the piston at any desired point, and give one or more single blows. The writer is of an opinion that the internal link combines the advantages of a self-acting motion with that of a ready hand-gear motion, and at the same time provides an efficient mechanism for controlling the slide-valve, which is necessary from the variety of blows required to be given by the striker.

When the hammer is worked by an arm or lever, the hammer head is fixed on one end of the arm, and the connecting-rod at the other. A socket carries the oscillating arm, and is arranged so that it can be raised or lowered relative to the centre of the horizontal cylinder, to suit the various sizes of the forgings, and for enabling round iron to be forged of any diameter. The bearings of the horizontal cylinder are supported either on a bed-plate fitted to the floor, or on the head of a hydraulic or pneumatic ram working in a casting. The hydraulic ram provides an arrangement for raising or lowering the whole machine, and enables blows to be struck at various inclinations, and also maintains the effective fall on any thickness of forging on the anvil. The upper part of the ram is made round, to allow of the whole machine revolving on a vertical axis, enabling it to be brought to work on any number of anvils arranged in a circle. The compounding of the various motions enables a blow to be struck in any direction on the circumference of the circle, of which the hammer-arm is the radius. The pipes for supplying steam to the cylinder are cast or fixed on the upper or lower side of casing, and to provide for the rise and fall of the machine they are made telescopic, and pass through a stuffing-box to keep them steam-tight.

In the absence of the writer of the paper, the discussion was deferred.

OVERWINDING, AND HOW TO PREVENT IT.

BY MR. W. FAIRLEY, F.S.S., OF LOUGHOR.

The object of Mr. Fairley's paper was to direct attention to his arrangement for stopping the winding upon the cage reaching the top of the shaft, and for which a patent was obtained on June 18, 1867. The object of the invention is to prevent the end of the rope, together with the cage, or whatever may be attached to it, being overwound the pulley placed at the top of vertical shafts, and is peculiarly applicable to the shafts of coal and other mines, and likewise to the hoists of warehouses or blast-furnaces, or wherever the steam-engine is used for winding from pits. It is likewise applicable to air or water-engines. At the upper part of the guide-rod is a bell-crank lever, which is acted upon by a catch attached to the cage. The other arm of the said lever is connected by means of rods and other bell-crank levers with the eccentric of the winding-engine. When the engine is running at full speed the working of the eccentric, and consequent motion of the slide valve, which opens and closes the ports alternately, is not interfered with, but when the cage reaches the top of the shaft the catch operating the bell-crank lever on the head gear lifts the eccentric. Mr. Fairley explains that if the connection between the eccentric and the slide-valve be broken its self-acting reciprocating motion will be destroyed, and the engine must come to a stand; the brakesman or engineer now does this by throwing the eccentric out of gear, by means of a foot lever. It is proposed to effect this at the proper time without the aid of the engineer, by the mechanical connection mentioned from the top of the pit across to the engine-house, and to the end of the eccentric rod. The shaft and cranks which are let into the guide, with the other connections, are so arranged that the slipper of the cage, on its ascent along the guide, will move the levers, and so put the eccentric rod in the position which it would assume were it operated by the brakesman. The position of shaft and cranks above the engine must be so fixed that the cage shall be neither too high or too low when the eccentric is put out of gear. It may be noted that if the eccentric be knocked out of gear when one of the portways has just been opened, the engine will go half a stroke before stopping; but if the disconnection be made when the slide-valve covers both ports the engine will stop at once. It is proposed to have a similar connection where the eccentric works a slot-link; but in this case, where there are two cages in the shaft, the gearing must for the one be the reverse of the other. The same connection may be made to shut the steam off.

Mr. Brogden enquired whether the principle had been applied at any of the collieries with which members of the Institute were connected? He should be glad to receive some information. They had tried Owen's patent catcher, and had had no difficulty with it in working. He gave illustrations of the value of the patent in cases of accident from the breakage of ropes, &c. He would not have a colliery in connection with their works of a winding character without its application—either iron or wooden rods.

The President enquired what guides Mr. Brogden used?——Mr. Brogden said they used wooden ones, but it could be applied to either. He did not say Owen's was the only valuable system, but he had had experience with it. He should be sorry to try an overwinding process without a safety-catcher also.

The President said doubtless Mr. Fairley would be prepared to give information at the next meeting, and the discussion was adjourned.

INSURANCE OF COLLIERS' AND MINERS' LIVES.

BY MR. CHRISTOPHER JAMES, OF ABERDARE.

Nothing need be said in favour of insurance in the abstract, the experience of many years, and the numerous applications of the principle by life, fire, ship, and accident insurance companies, are proof sufficient of the advantage of distributing among many the burden of a misfortune to which each is liable. Various persons have suggested the insurance of both the property of the master and the lives of the men. Little more need be said of the first than that the circumstances of the collieries vary so much that an equitable premium could scarcely be fixed, while the assessment or valuation of the amount of loss sustained through an accident would be so difficult that an association having this object in view could scarcely hope for success. The insurance of the lives of the men for the benefit of their dependants is, however, a much simpler matter, and the writer believes would be immediately and largely adopted, if there were an association in which the men themselves would place confidence. He does not think that any company, as insurance companies are ordinarily constituted, would be viewed favourably by the colliers. He believes that if it were in the workman's power to pay a weekly sum for the benefit of his widow, as he now does for his medicine, school, and club, and into the hands of persons on whom he could rely to employ the money solely for the one object without gain to themselves, there is no doubt that very many would avail themselves of it. The owners of collieries, in so far as they have no certain means of guarding against a loss that may be ruin to them, are in the same position as the men; it is true that in cases of accident the employer is under no liability, either legal or moral, to support the widow of every or any man who may be killed when in his employ, any more than a shipowner is to provide for the family of a sailor who may fall overboard. But he thinks that most masters would, however, gladly assist their men in making such a provision, even at the cost of some trouble and expense to themselves. Why cannot this assistance be given by the coal-owners of each district receiving the contributions of the men, and themselves contributing to a common fund? An objection to this has been frequently urged: that some collieries are safe and others not, and that, therefore, contributions made to such a fund by the masters, in proportion to the quantity of coal raised from different pits, would not be equitable. A sufficient answer to this is, that the most fatal accident in Wales has taken place at a colliery second to none in natural advantages, or in the anxiety and liberality shown by the owners to ensure the safety of their men. How many coalowners can say that their collieries are more liberally managed than Ferndale, and how many would be prepared to support the sufferers from such an accident as has happened there at their own cost, and without depending upon the spasmodic charity of the public, roused by the news of an accident of greater magnitude than usual?

The writer suggests that the surplus of the Hartley Relief Fund should be applied as a reserve fund for his projected association, the principal object of such association being the provision of a guarantee sufficient to induce the men to contribute to it voluntarily. The obtaining of contributions from the employers and landlords in proportion to the magnitude of their works, or the number of men engaged in them; but in such a way that no misapprehension should arise in the minds either of the workmen or the public as to their being in any way personally liable for the support of widows, or for any larger sum than their usual quota. There should also be provision for receiving contributions or bequests from charitable persons, which the writer has little doubt would be often made were the association properly formed; and there should be simple and inexpensive machinery for the collection and payment of money.

As an additional inducement to the men to subscribe on as long as the subscription was voluntary, a larger amount of relief might be given to the dependents of those who insured than to others, upon some such scale as the following:—To the widow of a man, uninsured, killed in the pit of an owner who subscribed, 50*l.*; to the widow of an insured man, killed in an insured pit, 125*l.*; to the widow of an insured man, killed in an uninsured pit, 100*l.* Such a scale of payments would, he thinks, be an inducement to both masters and men to join the association. The 100*l.* payment proposed to be given to the widow of a man killed in an uninsured colliery assumes the association to be constituted as an insurance company, and the case could not arrise in an association of coal owners. If subscription by the men were to be made compulsory, either as part of their contract, or on the declared wish of (say) two-thirds of their number, a clause might be introduced into the next Act of Parliament relating to mines legalising the deduction of the amount from their wages for that purpose. The majority of our colliers would cheerfully consent to this compulsory deduction if assured that the amount would be properly employed. The amount contributed by masters and landlords should be in proportion to the number of their men. The safety of each colliery must be assumed to be the same, and does not, therefore, enter into the calculation. The actual amount will depend upon the sum given to each widow, the average number of tons of coal raised for each life lost, and the proportion of the premiums paid by the men.

No relief could be given on account of sickness or simple injury, or in the event of death incurred elsewhere than at work; relief in such cases is the duty of the "clubs" only, and no general association could undertake the inspection of medical certificates, &c., without great probability of imposition. It could concern itself only with assisting the dependants of persons actually killed. Such an association might be organised, and started by way of experiment, by even a small number of coalowners; and if it were made generally known that the experiment was about to be made, so as to give all an opportunity of joining in it, there would be no impropriety in asking that the Hartley, or other similar funds, should be set aside to protect the insurers against loss in the event of a greater number of deaths occurring than was anticipated. How much money should be given to a widow? whether it should be paid in one sum or as a weekly allowance; and, if so, for how long a time? In other words, the amount of the policy are questions that must be answered before anything can be said, as the amount of premiums or contributions that would be required. Some misapprehension seems to exist on this point, as it has been stated that 1-16th or even 1-20th of 1d. paid for each ton of coal raised would be sufficient to provide for the sufferers by all pit accidents. To show that this would be quite inadequate to give any substantial relief, a few figures will suffice. The year 1866 may be taken as a more favourable one than usual; no single accident occurred causing great loss of life; the coal trade during the period was good, and the death rate compares not unfavourably with that of the other districts of England. The number of persons employed was 29,000; the number of deaths, 120; the number of tons of coal raised, 9,876,443; the number of tons of coal raised per life lost, 78,137: 1-16th of 1d. per ton on 78,137 tons would be 20*l.* 5*s.*—too small a sum to be of much use to the dependants of any man.

To pay an annuity of 8*s.* a week to the representative of each man killed would require about 350*l.*, taking the ages of the widows supported by the Hartley and Oaks funds as a fair average. Many will be of opinion that this is too much, and that if provision were made to secure two or, at most, three years' income, or (say) 130*l.*, it would be ample. Taking 3*s.* 6*d.* to be the average wages paid for "getting" a ton of coal, 78,000 tons to be the number raised for each life lost, and 130*l.* to be the amount of the policy of insurance payable on each death, it would require a payment of 2¼*d.* in 1*l.* to provide for it. The number of persons employed in South Wales (29,000) having to find 100*l.* for each of 120 widows, would have to pay 8*s.* 3*d.* per annum, or 2*d.* in 1*l.* on an annual earning of 49*l.* This agrees tolerably well with the calculation made on the assumption of each ton of coal costing 3*s.* 6*d.* for labour. This amount of 8*s.* 3*d.* per annum, even if equally divided between master and man, is a heavy one, but it can only be reduced by diminishing the amount of the policy. It would be barely sufficient to provide relief in cases of death, and quite inadequate to form a fund to benefit sufferers from non-fatal injuries. What amount would be sufficient to do this it is at present impossible to say.

The President thought that in such a district as this practical men should be able to agree upon some plan of assurance. He thought if some plan were agreed upon it would go a long way towards its enforcement by Act of Parliament. He believed what Mr. James advocated was that there should be committees for certain districts, and that so much per ton should be charged upon the coal raised, and so much in the pound deducted from the wages of the men, to supply a fund for the various districts.

Mr. James thought it the most advisable plan that the burden should be distributed between landlords, colliery proprietors, and workmen. The mode in which such assurance should be effected it was very difficult to determine.

The President: They were aware that there was a sick and doctor's fund at most of the various ironworks and collieries. Could not these be extended, so as to form a fund for assurance? In large accidents there was a considerable amount contributed, but they were now speaking of single accidents, or where two or three lives were lost.——Mr. James believed it could be done, but it would be difficult; and he was of opinion that the burden, to give adequate relief, would be heavier than was generally thought.

Mr. Brogden, looking at the subject as a master, said it became a question how men who had invested large sums in works could assure themselves as well as the men; the interests of the two could never be severed. The writer of the paper admitted that men engaged in hazardous callings were paid higher wages, and to that extent the workmen were enabled to lay by a certain sum, to which the employers contributed directly or indirectly. One difficulty was the possibility of causing jealousy on the part of the workmen, because his experience was that jealousy did arise when masters placed themselves in a position to handle the funds of the men; whereas they would find over and over again, from the Trades Commission, that when the men had the operation of their own societies that jealousy was to some extent modified. If they had an assurance society, he thought it should be a speculation apart from the government of the masters, and if the gentlemen who advocated some organisation would place it on that ground, and have their own officers, and do it on a large scale, it might answer; but he questioned if gentlemen connected with works on a large scale would be permitted to manage the funds without great jealousy on the part of the men, a result which they ought carefully to avoid.——The discussion was then adjourned.

Papers were then read—by Mr. John King (communicated through Mr. Thomas Evans), "On King's Patent for the Prevention of Accidents in Pits; by Mr. Morgan Morgans, "On the Brendon Hills Spathose Iron Ore and Mines." Specimens of the ore and diagrams, &c., illustrating the other subjects brought before the meeting were exhibited. Votes of thanks to the writers of the papers, and to the Chairman, brought the proceedings to a close.

THE DINNER.

After the close of the business meeting the members dined together at the Westgate Hotel, Mr. Bedlington presiding, and Mr. Brigden occupying the vice-chair. The company was substantially the same as was present at the Town Hall, with the addition of Mr. W. Lane, Mr. A. Murphy, Mr. Alderman Brown, and a few other friends.

After the removal of the cloth the Chairman gave in succession the usual loyal and patriotic toasts, coupling with the toast of the Army, Navy, Militia, and Volunteers the names of Captain Murphy and Major Banks, who both replied. Mr. David Joseph gave "The Coal and Iron Trade," and in doing this predicted for those industries a speedy recovery from the lethargy which has surrounded them for the past two or three years.——Mr. Brogden, whose name was associated with the last toast, also spoke in similar terms upon replying.——The President then gave "The Mayor and Corporation of Newport," and in the absence of the chief magistrate (Mr. T. M. Llewellin), who was occupied by business at the Assizes, Mr. James Murphy replied.——Mr. Alderman Brown, in a few brief and able remarks, proposed "The health of the President, Mr. Bedlington," whom he characterised as eminent in his profession as mining engineer.——Mr. Bedlington returned thanks, and after several other complimentary toasts had been proposed and responded to the company separated.

A GEOLOGICAL SOCIETY, MUSEUM, AND MINING SCHOOL FOR WALES.

[The following paper was sent to the Ruthin Eisteddfod by Mr. S. Jenkins].

The above subject having been brought before the Eisteddfod on previous occasions is my apology for intruding on notice this time. It was introduced at Aberystwith in 1865; at Chester in 1866 a full discussion was had on the subject. Nothing material was done at Carmarthen in 1867. There are many in the Principality who feel the deepest interest in the movement; but unhappily there has been as yet no understanding or organisation between them. The Eisteddfod has done something towards fostering geological knowledge; it offers a prize for an essay on a given subject every year. This, however, does but stimulate only one, and the same one year after year, to compete for the prize although there are many who are capable of doing so. The social science section of the Eisteddfod has been added, to nurture the sciences. A distinction, however, should be made between "social science" and "physical science." Geology, mineralogy, crystalography, palæontology, &c., belong to physical science. Hence it was proposed at Chester, by the Rev. Dr. Nicholas, to a physical science section added to the Eisteddfod. Had this been done we apprehend the science section of the Eisteddfod would be in a better position to develope the scientific capabilities of the Principality. The development of the Eisteddfod, however, like the building of Rome, is not the work of a day. He sincerely hoped the authorities will endeavour to accommodate the national institution to the spirit of the times, and the real wants of the Welsh people; then it will instruct as well as please, and benefit the head as well as the heart. It is only by attaining this that any institution can be permanently safe.

A geological society for Wales would be of immense benefit. Wales is a pre-eminently geological country. The British Isles were destined by the decrees of Nature to attain a high position in the scale of nations from the fact of the vast mineral deposits that were placed here. Look at coal. In the year 1866 England contributed nearly 75 per cent. of the consumption of the whole world—101,000,000 of tons. Great statemanship, without great mineral deposits and physical capabilities, would never make a country great. The miseries of Ireland, says Prof. Jevons, were created millions of years ago, when its deposits of coal were washed away. America, is destined to be a very great country, because of its great deposits of minerals. It is a singular fact that every deposit and strata—save one or two quite unimportant—that have been found in any part of the globe, have been found in the United Kingdom. Hence the great variety of trades that are found here. It would be difficult to find a well-informed person now who does not know something of the formation of rocks, metals, and minerals. There was a time, not very far back, when the assertion that the earth is not now the same as when it came out of the hands of its Creator, but has been formed by secondary causes, would shock ordinary ears, as much as Galileo's assertion did the Inquisitors. Now we hear it without wonder. Dr. Wm. Smith—the father of geology—chased away much of the dense fog that clouded his favourite science; and since then geology has made as rapid strides as any known science. Geology is interesting in whatever aspect we look at it, whether the variety of objects it presents to us, the time necessary to complete the different formations with which we are acquainted, the upheavals, faults, slides, contortions we notice in the earth. The fossils contained in the earth, what a history these unfold before there was any human historian created to record them, either by molten lead in the rocks or hieroglyphics! Among these, what wisdom, what adaptation do we see! What huge animals and tiny insects do we see, from the ichthyosaurus to the tiny infusoria that compose bay iron ore, of which it takes more than a thousand millions to form a cubic inch! We find in the earth the remains of quadrupeds that fearlessly roamed the primeval forests; trees, plants, and flowers that were wafted by the breezes that blew millions of years ago, when time itself was young; and insects that basked their wings in rays of light emitted when the sun was fresh as a bridegroom; and fishes that inhabited the mighty deep soon after the Divine fiat went forth to separate the dry land from the waters. We see in the rocks evidences of the mighty wars of elements that have taken place at different periods, when the contending foes—fire and water—fought with unabated fury for a considerable time, until at last water won the battle. How long this state of things lasted it is impossible to give even an approximation; for nearly a hundred years ago the Royal Society of London offered a prize of one hundred guineas, open to the whole world, to whoever could give the best idea of the necessary to complete the strata as they were known to exist, according to the known rate at which rocks were then forming. The prize has not been competed for up to this time; it baffles the ingenuity of man, and the most vivid imagination shrinks from the task. Then we have affinity, the great principle that combines every substance. Some particles unite far more readily than others do, while some particles will never unite. This is governed by a law, and that law is of the utmost importance to understand, if we would know anything of the formation of rocks and minerals. How often do we see persons trying for lead, copper, or coal in places where there is no affinity for them? Then there are the electric currents; what powerful but quiet agents these are in the formation of everything, whether animal, vegetable, or mineral! Nothing does or can exist without electricity; we might call it the principle of life. Then we have the electro-chemical agency—heat, water, pressure, lateral pressure, and probably many other agencies with which we are at present unacquainted, that we must know something of before we can account for the great diversity of formations with which we are acquainted. Many appeal to the deluge to account for nearly every alteration connected with the face of the globe, while there is no clear evidence it was universal, and even were it universal it would be impossible to understand how the same agent could have worked in so many different ways. We want also some additional light to reconcile the teaching of geology with the scriptural account of the creation, and so unite scientific men and divines. At present even no one need fear a thorough, candid, examination of the two, because, as Dr. Buckland says, "Scientific truth, rightly understood, is religious truth." The same Omnipotent Being is the author of Nature and the Bible alike; and we may rest assured that nothing in the one will gainsay anything in the other, if rightly understood. Every truth is an emanation from the Deity, whether it be religious truth, scientific truth, or moral truth; therefore it is eternal, and will stand for ever. Human understanding is so limited that it often mixes a large amount of error with truth; error, having no foundation, falls—not so truth. Geology has, no doubt, errors even at present, although geologists have the experience of men who were mighty in its allied branches, such as Newton and La Place in astronomy, Agassis in natural philosophy, Cuvier in comparative anatomy, Linneus in botany, and Buckland, Pye Smith, and a host of others in their own sciences. Whatever discrepancies, real or fancied, may at present appear between the teaching of science and religion, we have no doubt their great Author will in due time raise up men to show clearly that "He has created everything beautiful in its time."

These questions and their like cannot fail to be of great interest to a geological society; but there is a practical view, which would be of great importance to Wales. The Welsh people may be said to be poetical people; their language is a poetical language. Had science been cultivated to the extent that poetry has been in the Principality, the Welsh people would be second to none in scientific attainments. A taste for science should be created in Wales; and a geological society would go far to do this, if well supported. Persons connected therewith, who have been earnest students of the great book of Nature, could give their ideas on the formation of lodes, whether they were formed simultaneously before or after the strata that surround them. Under what circumstances lead, copper, gold, silver, manganese, coal, iron, slate, and other useful metals and minerals are found. In what strata they occur, and why they are formed in that peculiar stratum, and not in others. The discussion of questions like these, by competent persons, could not fail to be attended by great practical results. Let us look for a moment at the formation of slate; what a wide field there is here for the attention of scientific and practical geologists; and how little is it understood even by our greatest men! There is the primary or Cambrian formation, mica slates, and talcose slate. How is it that mica-slate formations are generally so much inferior to the Cambrian? What influences were at work in the primary that were not at work in secondary formations? What is the cause of slants, foot joints, back joints, and pleriad—*i.e.*, the capability of spliting the slate rock at right angles with the proper split? Why are these so perfect in the primary, and often so defective in the secondary? How is it that some strata will make only slabs that cannot be split thin enough for slates? Then what is the cause of slate-rock spliting? Slab-rock not admitting of this, that influence must have been absent when it was forming. Then why are slates of different colours—some grey, others every shade of blue, some are black, while others are red? We see sometimes different colours even in the same beds. What gives these different colours to slate rocks? Is it the same thing that gives colours to vegetation—the presence of alkalies? some slate rocks have too great a proportion of lime in their composition, the lime carbonises, and the slates very soon decay; other slate rock has too great a proportion of iron—the iron oxydises and discolours the slate greatly. Now, what great good it would do the enquiring minds of Wales to have intelligent discussions on questions like these.

A Museum and Mining School would also be very desirable for Wales. A creditable museum could soon be collected. I have been shown many private collections, in different parts of Wales, of minerals and fossils, as well as in natural history. I was agreeably surprised a short time ago, while staying at Fishguard, South Wales, to find Mr. Thomas, Castle Hill, possess a most intresting collection in natural history and antiquities. Also what facilities we have for establishing a mining school in Wales. Many a time have I seen young colliers, miners, and quarrymen in Wales, their eyes beaming with intelligence, and thirsting for knowledge, when there were no means of satisfying it. Many a bright intellect in Wales withers and fades, because there are no means of developing it. I apprehend the time is come to solicit the aid of Government to do something for Wales in this direction. Education will very soon become the grand question of the day. High and middle class education for Wales has at length arrested the attention of the Commissioners of Education. Is it too much to expect aid similar to the aid granted to the Royal School of Mines for a country that has contributed in no slight degree to England's commercial greatness?

Samuel Jenkins (Manodfab).

The British Association.—The thirty-eighth annual meeting of this association, at Norwich, commencing on Wednesday next, promises to be a success. The Masonic-hall, Theatre-street, will be opened as a reception room on Monday, August 17, at 12 A.M., and on the following days at 8 A.M., for the issue of tickets to members, associates, and ladies, and for supplying lists, and prices of lodgings, and other information to strangers on their arrival. On and after Monday, August 17, members and persons desirous of becoming members or associates, or of obtaining ladies' tickets, are requested to make application in this room. There will be an office for supplying information regarding the proceedings of the meeting. Members and associates may obtain railway pass tickets and information of local arrangements on application to the local secretaries at Norwich. The first general meeting will be held in the drill-hall, on Wednesday, at 8 P.M. precisely, when his Grace the Duke of Buccleueh, K.G., F.R.S., &c., will resign the chair, and Dr. J. Dalton Hooker, D.C.L., F.R.S., &c., will assume the presidency, and deliver an address. The different sections will assemble in the rooms appointed for them, for the reading and discussion of reports and other communications, on Thursday, August 20; Friday, August 21;

Saturday, August 22; Monday, August 24; and Tuesday, August 25, at 11 A.M. precisely. The committee of sections will meet in rooms adjacent to the section rooms, at 2 P.M., on Wednesday, August 19, and at 10 A.M. precisely on the other days. The general and evening meetings are on Thursday evening, August 20, at 8 P.M., in St. Andrew's-hall, soirée; on Friday evening, August 21, at half-past 8 P.M., in the Drill-hall, a discourse will be delivered by Mr. J. Fergusson, F.R.S., On the Archæology of Early Buddhist Monuments; on Monday evening, August 24, at half-past 8 P.M., in the drill-hall, a discourse will be delivered by Mr. W. Odling, M.B., F.R.S., On Reverse Chemical Actions; on Tuesday evening, August 25, at 8 P.M., in St. Andrew's hall, soirée; on Wednesday, August 26, concluding general meeting, at half-past 2 P.M., in the Drill-hall. Excursions on Thursday, August 27.

FORMATION OF GOLD NUGGETS IN AURIFEROUS DRIFTS.

At a meeting of the Royal Society of Victoria, held in the society's hall (Mr. R. L. J. Ellery, President, in the chair), Mr. COSMO NEWBERRY read the following paper, On the Formation of Gold Nuggets in the Auriferous Drifts:—

"At the meeting of the society in September, 1866, Mr. Charles Wilkinson read a paper with the same title as the one I now propose to read, in which he stated that I was carrying out a series of experiments based on the interesting discoveries he had made. Before describing my experiments and results, it may be well for me to give an abstract of the arguments used against the denudation theory, and in favour of what seems to some a rather ludicrous idea—the growth of nuggets in the drifts. Through the kindness of Mr. Ulrich, I have been able to read over the latest idea of the eminent chemical geologist, Prof. Bischoff, on this subject, which I shall freely quote.

That some portion of the gold found in the auriferous drifts has been derived from the quartz reefs at the same time that the drifts themselves were formed there can be no doubt. But the very marked difference between much of the reef gold and the drift gold tends to make us believe that this portion of it had some other origin, or was transferred from the reefs to the drifts by some means other than denudation. And when we consider that the nuggetty gold consists of nearly the heaviest known matter, offering but a very small surface of attack when compared with the other constituents of the drifts, it appears strange that they should be found at a great distance from any known reefs, as nearly all the large nuggets have been. Some of them are found in the sand overlying the gravel, which is quite inexplicable, remembering their weight and the otherwise regular arrangement of the deposit from the surface downwards—first clay, then sand, and fine and coarse gravel. These objections to the denudation theory are not easily explained away. Added to which is the fact that gold is contained in the iron pyrites found in the drifts, assuming the form of roots and branches of trees, and also replacing and impregnating the carbonaceous matter of the drift wood. This proves that gold did exist in the meteoric water which circulated through the drifts and deposited iron pyrites at a comparatively recent date. Based upon these arguments, Mr. Selwyn some year ago advanced the hypothesis that nuggets may be formed, and that particles of gold may increase in size, through the deposition of metallic gold from the meteoric waters percolating the drifts, which waters, during the time of our extensive basaltic eruptions, must have been of a thermal and probably of a highly saline character, favourable to their carrying gold in solution. As Mr. Ulrich points out in his essay on the Mineralogy of Victoria, this view of the character of the meteoric water in earlier times receives proof from the fact that on our western gold fields only, where tremendous basaltic eruptions have taken place, all the large nuggets have been found; while on the eastern and northern fields, where basaltic rocks are wanting, or of very limited extent, the gold is usually fine, and nuggets above an ounce or two in weight very rare. That gold does exist in solution in some saline waters at the present day has been proved by analysis, and Mr. Daintree, I believe, found gold in solution in water taken from a mine in this colony. Further proof of gold having been in solution at a comparatively recent date I found when examining the pebbles of the miocene drifts. These rounded quartz pebbles are often coated over and cemented together by brown iron ore, in which I found gold, while I never could discover any in the pebbles themselves. What the gold salt was, whether a chloride, silicate, or sulphide, we have no means at present of ascertaining, and as it may have been in the same solution that deposited the pyrites, which probably contained its iron in the form of protocarbonate with sulphates, it was not easy at first to imagine any ordinary salt of gold existing in the same solution as a protosalt of iron; but this I find can be accomplished with very dilute solutions, in the presence of an alkaline carbonate and a large excess of carbonic acid, both of which are common constituents of mineral waters, especially in Victoria. This is true of chloride of gold, and if the sulphide is required in solution, it is only necessary to charge the solution with an excess of sulphuretted hydrogen. In this manner both sulphides may be retained in the same solution, depositing gradually with the escape of the carbonic acid. Prof. Bischoff has suggested the occurrence of sulphide of gold in meteoric waters, and by experiment he found that it was slightly soluble in pure water. Once formed and present in the water, it is, like all other gold salts, easily decomposed. In an experiment I have made, the sulphide of gold was held in solution by a small quantity of an alkaline bicarbonate. A cube of iron pyrites and a chip of wood were introduced, and in a few days small irregular grains of metallic gold were deposited on the pyrites. What part the organic matter took in the reaction is not clear, but the gold was not deposited in the absence of it. In Mr. Wilkinson's paper a series of experiments are described in which gold was deposited in the metallic form upon a nucleus from a solution of the chloride by the reducing agency of organic matter—the nuclei being either gold itself or iron, copper, and arsenical pyrites, galena, zinc blende, sulphide of antimony, &c. Organic matter has long been known as an agent for precipitating gold in the metallic state from its solutions. Rose states that oxalic acid precipitates it in metallic laminæ. This I have failed to produce. When boiled with a solution of chloride, I got purple and red precipitates, but when allowed to remain at the temperature of air for some hours, a film of gold floated on the surface of the liquid, and the bottom sides of the vessel were gilded. Tartaric, citric, and other organic acids have much the same effect. With wood, bark, charcoal, and like substances the reduction is much slower. No carbonic acid is seen rising, and the gold is deposited in the pores of the reducing agent, if the solution is dilute. But it was not known until the experiment of Mr. Daintree, and the following ones made by Mr. Wilkinson, that the deposit would take place on a nucleus, and be continued as long as gold remained in solution. If their action went on in the drifts it would account for the greater purity of the gold, and for the nucleus of brown iron ore so often found in nuggets and crystals. Strong solutions of gold immediately begin to decompose the pyrites, and interfere with the regular deposition of gold by a strong solution. I refer to one containing more than one grain of chloride of gold to an ounce of water. A weaker solution than this also decomposes the pyrites, but so slowly as not to interfere with the deposit taking place regularly. All the other sulphides are also decomposed. In the experiment in which galena was used as a nucleus this decomposition was best marked. Somewhat more than a year ago I placed a cube of galena in a solution of chloride of gold, with free access of air, and put in organic matter. Gold was deposited as usual in a bright metallic film, apparently completely coating the cube. After a few months the film burst along the edge of the cube, and remained in this state, with the cracks open, without any further alteration in size or form being apparent. Upon removing it from the liquid a few days ago and breaking it open, I found that a large portion of the galena had been decomposed, forming chloride and sulphate of lead and free sulphur, which were mixed together, encasing a small nucleus of undecomposed sulphide of lead. The formation of these salts had exerted sufficient force to burst open the gold coating, which upon the outside had the mamillary form noticed by Mr. Wilkinson, while the inside was rough and irregular, with crystals forcing their way into the lead salts. Had this action continued undisturbed, the result would have been a nugget with a nucleus of lead salts; or, if there had been a current to remove the results of the decomposition, a nugget without a nucleus of foreign matter. If, instead of galena, we had had a piece of pyrites to start with, the decomposition would have gone on in the same way, but the result would have been brown iron ore in place of lead salts. This decomposition gives a very simple means of accounting for the oxide of iron so often found in the nuggets and crystals of gold, the latter especially, as shown by the experiments of the late Dr. Becker, by cutting them in halves, and by their established low specific gravity, and their loss in weight suffered in smelting. Finding the brown iron ore of the miocene drifts contained gold, I was led to suppose that, though I could not make gold deposit on it, I might succeed in making them deposit together, which was the case. I arranged a mass of sand with chips of organic matter in it in a vessel, and slowly filtered through it a dilute, nearly neutral solution of sesquichloride of iron, containing a few drops of chloride of gold, and as it passed through repeated the dose. This continued for some weeks without any appreciable change taking place, but after some months thin bands of hydrated sesquioxide of iron began to form across the mass about the centre, parallel with the surface; as they increased in size they assumed a botryoidal appearance like the 'ferro-manganese ore' which occurs in the quartz reefs, and in many parts were coated with a bright film of metallic gold; every further addition of the mixed solution produced another layer of oxide and gold, so that in time it appeared stratified. If the gold had been continued alone, after once having started its deposition, the result would have been the same as in the case of the decomposition of pyrites. On the other hand, if the iron solution was in excess after a deposit of gold had been formed, it would have produced what in so often found in the alluvial workings, a nugget coated with iron ore, commonly known as 'black gold.' This mixed solution is one which we would not expect to find in nature, but there is no difficulty in supposing the transfer of gold with iron that would deposit as oxide, even if we need to introduce carbonic acid. If a solution of sesquichloride of iron and chloride of gold are heated together, the whole of the gold, in a very finely divided state, with a portion of the iron as sesquioxide, is deposited in a brownish yellow precipitate. Though the processes I have described will account for the formation of nuggets, it does not account for the appearance of gold in pyrites. I have examined about 100 samples, in none of which do I find any tendency on the part of the gold to assume the form of a coating, it being usually in irregular grains and small octahedral crystals, seldom to be detected, even with the aid of the microscope, until nearly all the pyrites have been oxidysed and decomposed; in a few exceptional cases pieces have been found projecting, but all tends to prove the priority of the deposition of the gold, and that instead of pyrites having formed a nucleus for the gold, the reverse has in a majority of instances been the case. It may also have been the first to deposit in the drift wood, for in all the experiments by Mr. Wilkinson and myself, the organic structure became so impregnated with gold that when ignited (so as to burn off the undecomposed organic matter) a golden model remained. This, which fell into some of my experiments, and were useful in keeping up a supply of fresh organic matter, became so thoroughly impregnated that in some cases the finest hairs on their backs and legs were to be seen in bright gold after ignition. Conditions such as these (before ignition) would be very favourable to the formation of pyrities, offering to a ferruginous water containing sulphates a reducing agent and a congenial nucleus for the crystals to form on. Crystalline gold is very easily made by simply introducing a chip of wood into a solution of chloride of gold containing 5 or 6 per cent. of the salt. The crystals are first seen on the surface of the liquid as a thick film, which, as it grows heavier, falls to the bottom, where it assumes a moss-like appearance. If this is examined under a microscope, it will be found to be a network of octahedral crystals, resembling very closely the gold crystals from pyrites. Those crystals have been repeatedly made, carefully closing the vessel, so that no dust may enter, and, falling on the surface, form nuclei for them. With these crystals I sometimes found irregular pieces of gold, some in places showing planes of octahedrons. In these experiments, as in all others, organic matter is necessary, the action ceasing when it is removed, starting again immediately with a fresh addition. These experiments are based on the assumption that the gold exists in the pyrites in the metallic form, and not as sulphide, as has been supposed to be the case by some. Mr. Daintree got gold in solution by digesting some of the pyrites from Clunes in sulphide of ammonium, but I have always failed to prove the presence of it as negative evidence against it. I have the result of experiments made by digesting the pyrites with an oxydising agent, washing the residue free from impurities, weighing the gold, and comparing the result with that got from a portion of the same sample made by the ordinary fire assay, and finding that they agreed. If sulphide of gold has existed in the metoeric waters, we might expect in some cases to find it; but, as before noticed, it is so easily decomposed that it is not possible for much to have resisted the heat caused by the basaltic eruptions. I have experiments now in progress which contain the sulphides of iron and gold in solution, but up to the present time without any result in this direction. Like some of the others I have spoken of, they may require a year or more to accomplish the end wished for. Prof. Bischoff suggests silica as a medium for the transmission of gold to the quartz reefs. Gold, as he points out, certainly has a great affinity for silica, always being found in connection with it in mineral veins in the drifts, and even in the pyrites, where I have always found silica as grains and minute nearly perfect hexagonal crystals, the occurrence of which I have always been at a loss to account for. The professor's experiment is a very instructive one. He reports it as follows:—'On adding to a solution of chloride of gold a solution of silicate of potassa the yellow colour of the former disappears. After half-an-hour the fluid turns blue, and in time a gelatinous dark blue precipitate appears, which adheres firmly to the vessel. After a lapse of some days moss-like forms are to be seen on the surface of the precipitate like an efflorescence. On exposure to sunlight no reduction takes place, but after a lapse of some months, if the precipitate is allowed to remain undisturbed under water, a decomposition takes place, and in the silicate of gold appear minute partly miscroscopical specks of gold.' If this is the method by which the gold reached the quartz lodes, as this professor argues, the origin of the silver is also that of the gold. The origin of the former we believe to be the silicates of the rocks, by the decomposition of which the silica is conducted to the lode cracks. In these silicates we have, therefore, to look for the gold, and it is possible that it is contained in them as silicate. To prove this is almost impossible, even if we found the gold; for it must, if present at all, be in a quantity too small to determine whether in combination or not. Silicate of gold is extremely insoluable in water; but if we assume that its solubility is in the same ratio to the solubility of silica as the gold of even our richest quartz reefs is to the silica in the reef, we will find no difficulty in believing this theory is possible. In several instances an amathestine colour has been observed in both quartz reefs and the wash-dirt of the drift. Mr. Aplin tells me that he observed in a lead near Beechworth this colour in the wash-dirt. In the mine no gold was to be seen in it, but on bringing it to the surface and exposing it to the air the colour disappeared, and the dirt was found to be full of very fine gold, which looks very much as if there had been a compound of gold with some other substance. Ulrich some years ago was told by Mr. Clement, a successful quartz-miner, that in the centre of the German Reef, Maldon, some 70 feet from the surface, where the quartz was 10 ft. thick, he observed dark blue clayey bands, portions of which on being brought to the surface and exposed lost all colour, and were found to be full of very fine gold. Be this as it may, there can be no doubt that nearly all the native sulphides contain gold, especially those which also contain silver. I have found it accompanied with this metal in every sample of iron, copper, and arsenical pyrites, galena, sulphide of antimony, and zinc blende, which I have examined from the rocks of this colony; and Dr. Percy proved its existence in every sample of galena he examined, even though they contained little or no silver. Bischoff, in reviewing facts like these, says that it has been repeatedly proved that in the decomposition of ore lodes the silver takes part in the oxidation processes, and is removed in soluble combinations. If such ores are auriferous, and after such decomposition the lodes undergo mechanical destruction, the gold will, as it is in a very minute state, be carried off with the results of the decomposition. The argentiferous character of native gold, and the auriferous character of native silver, show that, although one metal passed into a soluble form and the other remained metallic, the separation was not complete. In this very minute state gold may possess properties differing from those which it has when in mass. Iron, for instance, when reduced by hydrogen from the oxide, has such a great affinity for oxygen that if dropped through the air at the ordinary temperature it takes fire, whilst ordinary iron filings, under similar circumstances, are not affected. It is, therefore, possible that gold, under certain circumstances, may, by the presence of silica in solution, become disposed to combine with oxygen, and then to form with the silica a silicate of gold. If further experiments prove that alkaline silicates favour the solubility of silicate of gold, the silica theory will be open to but few objections, and the difficulties to impede our progress in solving this most interesting problem in chemical geology will be greatly diminished."

Some discussion of a scientific character took place on the paper, and a hope was expressed that Mr. Newberry would continue his interesting experiments.

MINING IN AUSTRALASIA—MONTHLY SUMMARY.

MELBOURNE.—A new gold field has been discovered near Pyalong, about 20 miles from Lancefield; several hundred diggers are on the ground. Great confidence is felt in the ultimate success of the tin mine a few miles north-east of Berwick. The ore is scattered abundantly amongst black sand, and contains a good percentage of tin. A mining return recently laid before Parliament shows the estimated value of gold raised in the colony, from first discovery of the fields to end of last year, to be 135,643,811*l.*; of tin, 195,045*l.*; and antimony, 30,426*l.* A beautiful diamond has been found at Young's Creek, four miles from Beechworth; several rubies also near Mount Martha; these will probably prove of commercial value.——Sydney: Total gold receipts during May, 14,953 ozs., a decrease of 4596 ozs. on last year. The prospects of the southern gold fields are encouraging. The yield keeps up well at Araluen, and exhibits a slight increase. At Kiandra crushing machinery is at work, and the average yield 3 ozs. to the ton. The Colinton diggings, recently discovered by the Chinese, promise well; it is anticipated these will prove extensive and remunerative.——Adelaide: A valuable discovery of silver has been made in an abandoned copper mine near this city; the amalgam of under 5 tons of ore produced 120 ozs. pure silver; the lode is from 20 to 30 ft. in width.——Brisbane: The accounts from the Gympie Creek diggings are very favourable: 12,000*l.*, the result of a week's labour, divided between one party. Another digger estimated a day's work at 1000*l.* An 81-oz. nugget has been washed out. Specimens of rich silver ore have been found near Rockhampton.—S.W. SILVER AND Co.'s *Circular*.

YORKE PENINSULA.—The Matta Mine, adjoining the Wallaroo, which stopped working a few months ago, has been sold for 6005*l.* to Capt. W. W. Hughes, and will shortly resume working. The smelting-works continue inactively employed, seven or eight furnaces only of 38 contained in that establishment being in operation. The improved condition of the copper market at home, and the prospect of a considerable addition to our mining population—a number of fresh hands having been engaged in Melbourne—hold out hopes of a reaction for the better in the business of the Peninsula. The shipping business of the port during the past month has been dull. Exclusive of the weekly steamer three or four vessels have arrived from Newcastle with coal, and two—the Criffel and Hoang Ho—from Port Adelaide, which are chartered to convey copper ore to Liverpool—are now receiving cargo. The exports for the past month have been comparatively unimportant, consisting of a small quantity of ore. At the Oddfellows' anniversary dinner, held at Kadina, Captain Dunstan, referring to the Wallaroo Mines, stated that in consequence of the low price of copper those mines were at the present time worked without yielding a profit to the proprietors. Mr. Boon, the discoverer of the Wallaroo Mines, holds a comparatively small share in them; but, small as it is, it affords him a splendid income, and clearly proves that the larger shareholders must derive magnificent dividends from the same property.

ARGENTIFEROUS GALENA.—During the past six months the Talisker Mining Company has sold in London five shipments of silver-lead, weighing 103 tons, and containing 7475 ozs. of silver, being an average of 74 ozs. silver and 1 dwt. 12 grs. of gold per ton of lead. There are now in transit to Messrs. Atkens and Co., the company's London agents, five other shipments of silver-lead, weighing 122 tons, and containing 9028 ozs. of silver, making a total of 16,503 ozs. of silver and 225 tons of lead shipped and sold during the past six months. The prices obtained for the lead have ranged from 17*l.* to 18*l.* 2s. 6d. per ton, and for the silver from 5s. 5d. to 5s. 5¼d. per oz. The poorest lead sold contained 69·4-18 oz., and the richest 77·8-6 ozs. per ton; but part of that now afloat contains 84 ozs. per ton. The ground from which the ore has been dug is between the 23 and 43 fm. levels, being a block of about 2 yards wide, 50 long, and 40 deep.—*South Australian Register*.

AUSTRALIAN MINES.

YUDANAMUTANA COPPER.—The directors have received advices from their superintendent, dated Adelaide, June 10, and from Captain Terrell, dated June 13—Blinman Mine: I have put four men this last month to continue sinking No. 2 winze; they have sunk about 10 ft., and I find the lode has greatly improved—in fact, it is nearly as rich as in No. 2 winze; it is from 2 ft. 6 in. to 3 ft. wide, solid ore, which is much better than the lode ever looked from the time we began to sink from the 10 fm. level. The lode in the bottom of No. 1 winze is as good as last reported—a splendid lode. The stopes in the back of the 25 and 10 fm. levels are looking the same as when last reported on. Last week I put a pare of men to clear up a winze in the bottom of the 25, and directly under the No. 1 shaft. It appears this place has been abandoned. We have cut a very promising branch of ore. I have a good opinion of this place, and shall push the work as fast as possible. The mine altogether is looking exceedingly well; more ore in sight every month. I consider that we have ore enough in sight to last us, with three furnaces in full work, two years. This must be gratifying to the directors."

WORTHING.—Adelaide, June 20: We have again the pleasure to hand you satisfactory information respecting the progress at the mine. The 83 fm. level north end still continues very promising, although rather harder. There is now again every prospect of its opening out and improving. As we have now water in the end we hope soon to drain the 53 north, a result that will greatly facilitate our raising ore and giving profitable returns. In the 83 south the features are far more favourable than ever they were at the 73, the leaders of ore continuing their course in the country, forming a lode, though hard and small; this end is also wet. We hope shortly to make headway again here. The favourable ground and good lode met with in this level have completely changed the aspect of affairs, as it has enabled us to open up sufficient ore ground to make full returns, and also to sink the engine-shaft, which we expect to commence in about a week. Ore raised during the month 240 tons. Regulus on hand 62 tons of 50 per cent., and 50 tons of ore of 10 per cent. Number of hands employed, 119.

GREAT NORTHERN COPPER (S.A.).—Mr. Whitington (under date Adelaide, June 22) writes:—"I have to acknowledge receipt of favour of April 24, and Mr. Bonney has communicated to me your remarks on the subject of smelting at the mine. In the letter addressed to him we are desirous, previous to incurring the positive expense of erecting the furnace, to be in possession of further details from Captain Tonkin, and I have written to him to furnish them (*vide* letter of June 11). On the receipt of these particulars we shall take such action in the matter as we consider they justify. It is with much pleasure I have to report the success of forking the water to the 10 fm. level with the whim and horse power. You will perceive by Captain Tonkin's report of the 13th instant that he has now six men driving the end west, and that in the present limited amount of work done since the water was forked he has got the lode carrying ore in a favourable character of ground. He speaks very confidently of the prospects of the success of this operation. Should no unforeseen obstacles intervene he is instructed to apply all the force he can advantageously in developing this point. Recent discoveries of silver in iron gossan of a high percentage is creating some sensation here. I have written to Captain Tonkin to examine this company's properties for similar indications, which I think may probably be found."

ENGLISH AND AUSTRALIAN COPPER.—Port Adelaide, June 22: The quantity of coal at Kooringa was 1208 tons; at Kapunda, 318 tons; and at Port Adelaide, 612 tons. There were five furnaces and one refinery at work at Port Adelaide. No further shipments of copper had been made since the date of previous advices, but there were 172 tons ready for shipment.

PORT PHILLIP AND COLONIAL GOLD.—Mr. Bland, Clunes, June 19: Quartz Crushing: The quantity of quartz crushed during the four weeks of May was 3147 tons: pyrites treated, 93 tons: total gold obtained, 2305 ozs. 5 dwts., or an average of 8 dwts. 23 grs. per ton. The receipts were 8541*l.* 17s. 8d. Payments (including 839*l.* 6s. 10d. paid for pump, firewood, and timber accounts), 5352*l.* 17s. 5d. Profits, 3189*l.* 0s. 3d., to which is added balance of last month, 303*l.* 7s. 7d., thus showing an available balance of 3492*l.* 7s. 10d. The amount divided between the two companies was 3000*l.*, the Port Phillip Company's proportion of which amounts to 1950*l.* The balance of 492*l.* 7s. 10d. was carried forward to next month's account. The quantity of quartz crushed for the first two weeks of June was 2740 tons, yielding 1103 ozs. 11 dwts. of gold, or an average of 8 dwts. 1 gr. per ton. Remittance, 1900*l.*

YORKE PENINSULA.—The directors have received advices from the committee of inspection of the company, at Adelaide, dated June 18 last, with reports from the Kurilla Mine to the 15th of that month. The following are extracts from the report of Capt. Anthony:—"I have ready for the market ore that will realise, at the price offered this month by the superintendent of Wallaroo Smelting Works, the sum of 170*l.* . . . Now that the winze is holed to the 36, I may be able to pay cost for a few months, and probably keep driving the 35 end east. This much is probable from present appearances. . . . My remarks in regard to the ultimate value of the mine must not be taken as referring exclusively to the 35 fm. level, or any other particular part of the mine; but in a general sense. . . . I have not changed my opinion in this matter, and I beg that you will take particular note of the following further remarks, as, if the mine is ever vigorously worked, it will be seen whether my opinion is correct or not. I wish to state distinctly that after still further acquaintance with the lode running through the Kurilla I have not detected a feature in it that detracts from its general healthy and promising character, and that it is not surpassed in appearance by any copper lode whatever where there is not a bunch of ore actually developed. If it formed a portion of either of the large mines of Yorke Peninsula no effort would be wanting to develope it, with the assurance of ultimate remuneration. The winze is sunk on the lode from the 15 to the 25 fm. levels, and (several fathoms to the east) from the 25 to the 35, also on the lode all the way. The lode, which is frequently the case, especially near the surface, is irregular in its size, appearance, and yield, but, on the whole, a paying lode." The committee mention that a discovery of ore had been made (by a party who had begun to work there by mistake, instead of on another more distant section of land) on section 412, belonging to the company, and near to 411, on which the Kurilla is situate, but nothing had, for the present, been done to continue the operations referred to on the part of the company.

SCOTTISH AUSTRALIAN.—The directors have received advices from Sydney, dated June 17, with reports from Lambton Colliery to the 15th of that month. The assistant superintendent reports as follows:—"I have still a favourable report to give as regards the progress of this establishment. We keep our position in the trade. The coals shipped last month amount, it will be seen, from the usual return sent herewith, to 14,373 tons." A slight reduction had been conceded by the Government to the company in the cost of the haulage and cranage of their coal.

FOREIGN MINING AND METALLURGY.

The imports of pig duty free into France amounted in the first five months of this year to 37,194 tons, against 15,523 tons during the corresponding period of 1867, showing an increase of 21,671 tons this year. On the other hand, the imports with payment of duty amounted to only 8193 tons in the first five months of 1868, as compared with 51,626 tons in the corresponding period of 1867, showing a falling off of 43,433 tons this year. The imports of iron and plates into France do not present any very great variations during the first five months of this year, as compared with the corresponding period of 1867, except as regards iron for shipbuilding, in which an increase of 1277 tons is observable this year. The whole of the exports by warrant of pig, iron, and plates were 60,613 tons during the first five months of this year, as compared with 51,954 tons during the first five months of 1867, showing an increase of 8659 tons this year. The direct exports of these products, including steel and machinery, presented also an augmentation this year, having amounted to 7208 tons in the first five months of 1868, as compared with 5687 tons in the first five months of 1867, showing an increase of 1520 tons. The quantity of minerals imported into France in the first five months of this year compared as follows with the imports in the corresponding period of 1867:—

Source of import.	1868.	1867.
Belgium.....Tons	29,639	52,918
Germany	33,912	27,596
Spain	23,586	19,179
Italy	24,392	20,491
Switzerland	1,653	734
Algeria	66,096	71,158
Miscellaneous	58	373
Total	175,336	195,779

There was thus a diminution of nearly 20,000 tons in the imports of minerals this year. The committee of forgemasters in the Champagne group assembled a few days since. After having been occupied with a project for a railway from Nançois-le-Petit to Troyes, the surveys of which have been authorised, the meeting heard a report read on the *octroi* duties levied at Paris on the importation of iron and pig. The meeting, after some discussion, decided that an application should be made to the municipal administration of Paris in order to obtain either the observance, without exception, of the decrees on the subject or the removal of the *octroi* duties from all metallurgical products. The Champagne committee of forgemasters is composed of gentlemen essentially protectionist in their views, and it was, then, natural that it should occupy itself with the system of warrants, in order to prove that it is the ruin of French siderurgical industry. The meeting of the committee closed with a statement by a member of his ideas as to the present industrial condition of the Champagne group; the gentleman in question was invited to submit his ideas more formally in a report on the subject. There is little to observe with respect to the French markets for iron and pig, except that they have not presented any material improvement. The Charentes Railway Company have concluded a contract with the Hayange house for the furnishing 30,000 tons of rails, at 7*l.* 15s. 7d. per ton, to be delivered after Jan. 1, 1869, at various points of the line. As regards the Moselle and Meurthe districts, it is stated that recent sales of pig have totally exhausted stocks, and that several furnaces have contracts on hand which will take off a considerable portion of their production for some time to come; prices have in consequence been easily maintained at 2*l.* 8s. 10d. to 2*l.* 9s. 8d. per ton; one establishment of the Meurthe has effected a sale at 2*l.* 9s. 8d. per ton, delivered at Ars-sur-Moselle. Some producers in the Moselle and the Meurthe consider also that they have found a new outlet in the South, to which they have made various deliveries. Casting pig, No. 1, continues to be well run off, but experiences at almost all points a serious competition from the products of Creusot. Work is active in the rolling mills of the Meurthe and the Moselle; the demand has been well sustained, and prices remain without change at 7*l.* 8s. The house of Wendel proposes to undertake the manufacture of tyres for wagon wheels. Some contracts for small materials have been let by the Eastern of France Railway Company. M. Labbé undertook to supply bolts at 14*l.* 4s. per ton, while MM. de Wendel engaged to supply chairs at 15*l.* 12s. per ton. The Val-d'Osne Blast-Furnaces and Foundries Company will hold a meeting on Aug. 27 at Paris.

The Belgian iron trade displays little change. The attention of the Belgian coal trade has continued to be a good deal occupied by the results of a recent adjudication for the coal required for the Belgian State lines; the sensible fall indicated in the price of coal is an important fact, the consequences of which may have a gravity which extractors do not attempt to conceal. It would seem that it is not to get rid of a considerable present stock that coal owners have consented to make the sacrifice which the tenders sent in at the late adjudication indicate, since the deliveries will extend far into 1869; but it would rather appear that producers are afraid that lower rates will prevail for a lengthened period. One extractor, communicating to a Charleroi journal his impressions on the results of this adjudication, remarks that since 1848 he has not seen such disastrous prices. The tone of the Belgian coal markets has not displayed any change during the last few days, and it is probable that this will be the case until next month, when it is hoped that a revival in affairs will appear. The extraction, although restricted, is, for the present, superior to the requirements of the trade, deliveries being in a languishing state. One satisfactory circumstance may be noted, viz.—that all indications of a threatened strike have disappeared in the basin of the Couchant de Mons. Meetings are announced as follows:—Anderlues Collieries Company, Aug. 12, at Anderlues; Marcinelle and Couillet Company, Aug. 13, at Brussels; Zône Forges Company, Aug. 13, at Zône; Longterne Ferrand Colliery Company, Sept. 3, at Elouges; United Proprietors Collieries Company, Sept. 10, at Marchienne-au-Pont, &c.

Annexed is a list of the principal Prussian companies now engaged in mining and metallurgical industry:—Ornontowitz, capital 208,000*l.*, coal and iron; Kœnigshulde, 192,000*l.*, iron and steel; Minerva, 640,000*l.*, blast-furnaces, mines, and forests; Tarnowitz, 48,000*l.*, mines, blast-furnaces, and forges; Vulkan, 160,000*l.*, mines, blast-furnaces, and forges; Nicolai, 240,0000*l.*, mines, blast-furnaces, and forges; Stolberg, 76,000*l.*, mines, blast-furnaces, and forges; Bohuum, 160,000*l.*, mines and steel; New Scotland, 320,000*l.*, mines, blast-furnaces, and forges; Porta Westfalica, 160,000*l.*, mines, blast-furnaces, and forges; Eschweiler, 20,000*l.*, mines, blast-furnaces, and forges; Dillingen, 192,000*l.*, mines, blast-furnaces, and forges; Phœnix, 496,000*l.*, mines, blast-furnaces, and forges; Concordia, 160,000*l.*, mines, blast-furnaces, and forges; Bonn, 160,000*l.*, mines, blast-furnaces, and forges; Berg, 160,000*l.*, mines, blast-furnaces, and forges; Rheulsh, 240,000*l.*, mines, blast-furnaces, and forges; Sieg-Rhin, 320,000*l.*, mines, blast-furnaces, and forges; Cologne and Mussen, 240,000*l.*, mines, blast-furnaces, and forges; Arenberg, 240,000*l.*, mines, blast-furnaces, and forges; Styrum, 80,000*l.*, siderurgical industry; Prince Leopold, 56,000*l.*, mines, blast-furnaces, and forges; Thubalkain, 160,000*l.*, mines, blast-furnaces, and forges; Mechernich, 512,000*l.*, mines and ironworks; Rothe Erde, 68,000*l.*, mines, blast-furnaces, and forges; Dusseldorf, 128,000*l.*, mines, blast-furnaces, and forges.

A fall which recently appeared in Chilian copper at Havre has provoked some rather important transactions in Chilian in bars; latterly, however, business has become much more restricted, and prices have been feeble; 37½ tons of Chilian, in bars, have changed hands for the end of the month of August at 68*l.* 12s. to 68*l.* 14s. per ton, and 25 tons for the end of the month of September at 69*l.* per ton, Paris conditions; the market closed at the last dates with a little better tone, disposeable obtaining 69*l.*, and for delivery at the end of September 69*l.* 12s. per ton. Business in copper

has been moderate at Paris; prices, nevertheless, have been a little better sustained. The movement of affairs has not presented any very great animation on the German copper markets, upon which purchases have been generally restricted to the immediate requirements of consumption. Transactions in tin have been moderate on the Dutch markets; some small lots of Banca have found purchasers at 55 fl., but if orders of a certain importance presented themselves they could easily be executed at 54¾ fl. As regards Billiton tin, 1400 ingots recently imported have changed hands at Amsterdam, at 52½ fl. There is no material change in the lead markets, and the same report may be made as to zinc.

MINING IN NEVADA, U.S.

The North El Dorado of the Belmont Company, near their south boundary, are taking out large quantities of chloride ore that will pay from $300 to $400 per ton. At the line dividing the North and South El Dorado, Leon and Co. have an incline on the lode now 25 ft. deep, from which they are taking an exceedingly fine quality of ore; thence south are a series of inclines on the El Dorado South, varying in depth from 20 to 100 ft., developing the ledge a distance of 800 feet lineally, the width of which remains unknown. The third incline from the north line, from which the principal part of the chloride ore hitherto reduced from this mine has been taken, a depth of 35 ft. has now been attained, disclosing a body of ore (chloride) unequalled by any other mine in the district or out of it. An attempt at a description of its appearance would be futile, the face of the ledge being literally covered with horn silver. It is estimated by those at work taking out this ore that it is fully 50 per cent. better than any heretofore taken from the mine: 50 ft. further south is the fourth incline, the depth of which is 20 ft., and from which high grade ore of identical type with that from the other is being taken: 50 ft. still to the south is a fifth incline, 25 ft. deep, and in ore equal to the others, and a large body in sight. All along below this at intervals are more openings, and in each one of them excellent chloride ore is to be seen, in such quantities as to fully establish the claim of the lode as among the best in the world. In the Arizona, which is believed to be an extension of the El Dorado, the developments continne to be good; and in the south incline of Antonio Borques' claim, at the depth of 50 ft., a rich stratum nearly 2 ft. thick has been disclosed near the hanging wall. A fair quantity of the ore had been brought to the surface, the estimated yield of which is high. Len. Martin is working the claim known as the Vulcan and Arizona Consolidated, with fine results, and is taking out considerable quantities of good ore for the mill. A claim called the Solia, lying between the Independence and the Arizona, and belonging to A. Borques, is also producing excellent milling ore. The wise course of the manager of the Combination mill in working custom ore has produced the most beneficial results.

The Buckeye Mine, in Summit canyon, three miles north of the Murphy Mine, produces ore of fine quality. By a certificate of assay, by Boalt and Stetefeldt, of the pulp of 16 tons of ore which have just been reduced at the Mettacom mill, the yield was $257·68 per ton. A former lot yielded nearly the same result. The Buckeye is under the superintendence of Major George B. Clendon, and we believe it is destined to become one of the permanent and valuable mines of the region. During 23 days of the quarter ending June 30, 71 tons of ore from the Hidden Treasure were reduced at the five-stamp mill of the Monte Christo Company, in the district of White Pine, which yielded an average of $120·21 per ton. The ore being chloride was simply crushed and amalgamated. It is said that with careful assorting 1 ton in every 20 produced by the mine would yield about $1000 per ton. The ore worked during the last quarter was second and third class, and represents nearly the entire body of the ledge, or deposit, only the rich pieces of horn silver being selected as first-class. The Hidden Treasure is said to improve in the deepest workings.

Late workings of ore from the White Pine district shows extraordinary results. Samples were from a lot of 6 tons reduced at the Manhattan Mill, the average assay of which was at the rate of $1376 per ton. But the "clean up" of the battery was also assayed, and gave the great yield of $1717 per ton: 12,046 lbs. of the ore, which was hauled to the Manhattan Mill, in this city, for reduction, gave the handsome yield of $6705·50. The choicest pieces of horn silver had been selected from the lot.

Great Yield of Cortez Ore.—The result of the working of 53 tons of ore from the district of Cortez averaged $458 per ton; for the amount of ore reduced the result is splendid. The rich ore was produced by the Garrison Mine, in which there is said to be plenty more of the same sort, and it was converted into solid silver bricks at the Mettacom Mill. The Yankee Blade Mine, situated in the Yankee Blade camp in this district, which was formerly one of the productive mines of this section, but which has been closed for a long while, is opened again, under the superintendence of Mr. John Frost, of the Manhattan Company's works in this city. The mine is furnished with powerful hoisting works, by which it will be freed from a vast volume of water, and put in condition for the operations of the workmen. We believe the Yankee Blade belongs to some of the stockholders of the Manhattan Company, who have at last put the property in shape for permanent working. It will add largely to the production of the district, for it is a good-sized vein of the highest quality of ore. During the month of June the Manhattan Mill reduced 541½ tons of ore, which yielded the handsome sum of $124,501·23. It will be observed that the mill averaged about 18 tons a day for its 20 stamps, and that the ore worked was of a high grade.

Coal on Green River.—I was shown this morning a letter written at Green River city on the 5th inst., in which the writter claims to have made important discoveries of coal. I give the following extract from the letter:—"Myself and companion located a section of land 22 miles from here, on Bitter Creek, for the purpose of mining for coal. We have 19 coal veins in the section; the one we are now opening is 5 ft. thick, and extends through the whole section of one mile square. From the mouth of our tunnel to the railroad track the distance will be only about 300 ft. The coal is of the anthracite quality. We have built a stone house on the claim, and have made openings on the four quarter sections. Our tunnel is now about 30 ft. long, and we are taking out 4 tons of coal a day. There is no market for it at present, but we can afford to wait for the market. The railroad company are pushing the work ahead, and their camps dot the road every two miles between this place and the North Platte, where the cars are now running, and they will reach this point by the middle of September." This morning a teamster brought into Austin 3 tons of coal from a canyon about 40 miles from Salt Lake city, which he offered to sell at the low rate of 6½ cents a pound. The coal is of the bituminous variety, and is excellent for the manufacture of gas.

FOREIGN MINES.

Capula Silver.—Captain Faull (July 8) reports:—"We made a final start with the engine on the 2d inst., the water was in fork in the shaft on the 4th, and is sinking fast in the winzes to the east of the shaft. San Enrique level is dry, but in the Esperanza level I expect it will take at least a week longer to drain, it being much further from the shaft. The engine is working remarkably well; during the time we were forking the water it went 15 strokes per minute in the shaft, with very little fuel. After the winzes are drained we shall weigh the fuel to know exactly the consumption; we got the steam up 25 lbs. to the inch with only a few shavings; in forking we worked up to 40 lbs. to the inch; we are still working with the 7-inch lift, but have got the 10-inch in order when required. The pitmen and two sumpmen are employed at present putting in bearers below adit for the screws to carry the lift, and clearing up the shaft. Next week we shall commence sinking. We shall immediately put four men to sink a winze below San Enrique level, close up the last cross-cut south, where we were stoping in March last. We shall commence next week clearing up all the winzes to the east and west of the shaft on the south lodes, and as soon as the water is gone from the Esperanza level we shall sink two winzes, one under San Jorge stopes, and the other under La Bomba, for stopes. There is a good but narrow branch of ore on the south side of the Esperanza, and which will, no doubt, widen as we get further west from the cross lode. The ground is more favourable for driving, and promises to become as productive as it was to the east of the cross lode. San Jorge stopes are still good, but La Bomba have fallen off a little. We are still raising about 60 cargas from these places of good quality ore. The lode in San Enrique end is still improving; some of the work will do for saving blue ore, with very pretty quartz. We have not yet met with the south wall; ground still hard. Torta No. 5, of 111 cargas, I trust will be washed next week: the assay is 27½ marcs per monton (to yield about 300 marcs, or about 2400 ozs. of silver). We have in the ore-yard 100 cargas of dressed ore, and about 50 cargas in bags, as it came out of the mine. We get about 20 cargas weekly by dressing over the attle."

Alamillos.—Aug. 1: The 4th level, driving east of La Magdalena shaft, yields ½ ton of ore per fathom; the lode is improving in appearance, and the ground getting easier for driving. The lode in the 4th level, west of La Magdalena shaft, is very wide, consisting chiefly of calcareous spar and lead ore, yielding of the latter 1½ ton per fathom. The 5th level, east of Gil's winze, yields 3 tons of ore per fathom. We have begun to drive this end east from the winze, and towards La Magdalena shaft. In the 5th level, east of Taylor's engine-shaft, the lode, although not yet clear of the cross-course, yields ½ ton of ore per fathom. The 5th level, west of Taylor's engine-shaft, produces 1 ton of ore per fathom; the lode is large and open, and easy for driving through. The 4th level, west of San Andriano shaft, is worth 1 ton of ore per fathom. In the latter part of the month this opened some good ore ground, but it is not so productive now. The driving of the 3d level, west of San Yago shaft, is suspended while the men are engaged in rising against Alfonso winze, to hole it. The lode in the 2d level, west of Crosby's cross-cut, is worth 1½ ton of ore per fathom; this is opening very good tribute ground. The 5th level cross-cut, north from La Magdalena shaft, will intersect the lode during the present month.—Shafts and Winzes: The sumpmen are getting on well in sinking Taylor's engine-shaft below the 5th level; the lode is worth ¾ ton of ore per fathom. Henty's shaft, below the 1st level, on the south lode, produces 4 tons of ore per fathom; this shaft is going down in a very firm and compact course of ore. Perez' winze, below the 2d level, yields ¾ ton of ore per fathom; the lode is irregular, and underlies south rapidly. Alfonso winze, below the 2d level, is worth ¾ ton of ore per fathom; the sinking is suspended for want of ventilation; the men are rising against it from the back of the level. Gil's winze, below the 4th level, which yields 3 tons of ore per fathom, is completed to the 5th level, and the men are put to drive east from the bottom of the same. Francisco's winze, below the 4th level, produces 1 ton of ore per fathom; the ground is harder than it was, and the men are, therefore, getting on slowly in sinking. The stopes generally are looking much as usual, and in the past month kept up a good rate of raisings. The surface work and machinery are going on with the usual regularity. We estimate the returns for August (five weeks) at 300 tons.

Fortuna.—Aug. 1: Canada Incosa Mine: The 110, east of O'Shea's shaft, produces 1½ ton of ore per fathom; the lode is large and open, but is not nearly so productive as it was. Good progress is being made in the 100, west of O'Shea's shaft, considering the hard nature of the ground. The lode in the 90, west of Judd's shaft, is very regular, moderately easy for driving, and producing 1½ ton of ore per fathom. The 80, west of Judd's shaft, produces ¾ ton of ore per fathom; the lode continuces very small in this level. The 70, east of Carro's shaft, yields ½ ton per fathom; there is a very good lode in a winze sinking in advance of this end, and we expect an improvement here shortly. In the cross-cut driving south at the 80 there is no alteration to notice.—Shafts and Winzes: Henty's shaft, sinking below the 90, being off the lode the ground is rather hard for sinking through. The lode in Pecon's winze is very small. Diaz' winze, below the 55, is being sunk in a valuable lode, yielding 3 tons of ore per fathom. We are sinking a new winze below the 45, east of San Pedro shaft; it is yielding 2 tons of ore per fathom.—South Lode: The 40, west of San Pedro shaft, yields ½ ton of ore per fathom. The lode in the 50, west of Gils winze, is of a good size, yielding ½ ton of ore per fathom. In the 50, east of Gils winze, the lode is large, composed chiefly of quartz, carbonate of lime, and lead ore; of the latter it yields ½ ton per fathom.—Los Salidos Mine: The lode in the 100, west of Morris's engine-shaft, is small and unproductive. In the 65, west of San Carlos shaft, the lode, which yields ½ ton of ore per fathom, is getting gradually smaller. The 100, east of Morris's engine-shaft, produces 2 tons per fathom; this is opening a valuable run of ore ground. The 90, east of Cox's shaft, is worth 4 tons of ore per fathom; the lode was rich during the past month. It has declined a little in value in the last few days. The 75, east of San Pablo's shaft, yields 1½ ton per fathom; the lode has changed unfavourably during the past week.—Shafts and Winzes: The sinking of Buenos Amigos shaft below the 90 has been slightly interrupted of late, but is now again in working order. The lode in San Gabriel shaft, below the 90, yields 2 tons of ore per fathom. Callejon's winze, below the 55 fathom level, produces ½ ton of ore per fathom. This winze is holed to the 65 fm. level. The lode in Corzo's winze, below the 90, is divided into two small branches, worth ½ ton of ore per fathom. The stopes yielded a very good quantity of ore in the past month, and have not undergone any unusual change. The machinery and surface works generally are going on regularly. We estimate the raisings for August at 500 tons.

Linares.—Aug. 1: West of Engine-Shaft: The lode in the 110, west of San Tomas engine-shaft, is small, yielding ½ ton of ore per fm. In the 75, west of Warne's engine-shaft, the lode is very wide, producing 3 tons of ore per fm. We expect to hole to the end driven east from Crosby's shaft this month. The lode in the 45, west of No. 159 winze, is very regular and compact, and produces 1½ ton of ore per fm. The 45, east of said winze, yields a similar quantity, and, like the last-named, is very compact, composed of quartz, calcareous spar, and lead. The 31, east of San Francisco shaft, also produces 1½ ton of ore per fm.—East of Engine-shaft: The 95, east of Taylor's cross-cut, is worth 1 ton of ore per fm.; the lode is very wide, and spotted with lead. The lode in the 95, east of No. 154 winze, is very changeable, and at present produces 1 ton of ore per fathom. The 95, west of No. 154 winze, contains a small and unproductive lode.—Shafts and Winzes: In Warne's engine-shaft, sinking below the 75, the lode, which now yields ½ ton of ore per fm., is not so productive as it was a few days ago. No. 158 winze, below the 85, will be holed to the 95 in the present month; lode worth 1 ton per fathom. Winze No. 160, below the 61, yielding 3 tons of ore per fathom, is being sunk through the same shoot of ore the 75 end is now in. The 161 winze, below the 85, produces 1 ton per fm. This is on the south lode, east of No. 146 winze, and in advance of the 95 fm. level. The stopes at Warne's Mine have yielded a good quantity of ore in the past month, and are looking well for the next. The machinery throughout the mine is in remarkably good working order, and the surface operations are going on with perfect regularity. We estimate the raisings for August (five weeks) at 325 tons.—Quinlento's Mine: The 32, east of Taylor's engine-shaft, produces ½ ton of ore per fathom. A very good shoot of ore was driven through in this end in the past month, but the lode is small now. The 32, west of Taylor's engine-shaft, yields 4 tons of ore per fm. This has opened a splendid piece of ore ground, and is looking right well at present. In Taylor's engine-shaft, sinking below the 32, the men did very good labour last month; they are now cutting cistern plat, and the sinking will be delayed a little, while the bearers, cistern, and standing lift are being fixed. In Addis's shaft, below surface, which yields ½ ton of ore per fm., the work was carried on very regularly in the past month, and will reach the depth for a 32 fm. level very shortly, when driving east and west from bottom of shaft will be commenced; lode large and strong, spotted with lead. In Cox's shaft, below surface, the mules keep out the water very easily, and the men are getting on well with sinking; the lode is small, but of a very kindly appearance. We have forked the water, and cleared up Addis's shaft below surface to the bottom. The water is, however, too much to allow of our sinking. I am, therefore, preparing a line of rods to attach to the steam-engine. The lode was left rather poor by the former workers, but contains lead in paying quantities.

Pontgibaud.—W. H. Rickard, Aug. 3: Roure Mine: The sinking of Richards's engine-shaft below the 125 metre level goes on very satisfactorily. The winze in the 100 south is looking more kindly, showing spots of ore. The 80 south is in soft, poor ground. The 60 south opens ore ground worth from ½ to ¾ ton per fathom. The rise in the back of the 40 south yields 1 ton of ore per fathom. The stollen south of whim-shaft has produced some stones of orey work during the month, but is again disordered and poor. The two cross-cuts west in this level are without change. The stopes and tribute pitches generally throughout this mine are rather poor.—La Grange: The sinking of Nosky's shaft below the 80 metre level has been resumed, and, the ground being soft, proceeds well. The 80 metre level north yields a little saving work. The 60, in the same direction, opens a little orey ground, worth ½ ton per fathom. The 20 north is unproductive. Our stopes and tribute pitches yield a fair quantity of stuff. La Rancoule adit cross-cut west is in most spare ground.—Mioche: The adit north is in a large disordered lode, showing spots of ore in barytes at times.—La Brousse: Basset's shaft will attain the required depth for a 100 metre level this month, when no time will be lost in intersecting the lode. The 80 metre level south yields 3 tons of ore per fathom. The 60 south yields 1½ ton per fm. The same lode, on the eastern part of the lode, yields 1 ton. A winze sinking below this level yields 6 tons per fathom. The 40 metre level south is poor. The 40 north is in shelfy, disordered ground, and, consequently, the lode is also poor. The 40, north and south of the eastern cross-cut, on No. 2 lode, yields occasional stones of ore. The cross-cut in the 20 south is hard and spare for driving. Our pitches throughout this mine yield well. We have set to drive on the lode in the 20 south from the western shaft; the lode is 5 ft. wide, of bunchy composition and appearance, and easy for exploring. We hope to make some discoveries at this point. The surface trial shaft, south from this mine, is down 12 metres, but still in volcanic rock.—Pranal: We have set the 70 cross-cut, towards St. Matthew's lode, to drive by eight men, to make all possible speed; the ground is exceedingly hard for these mines. The 50 metre level, north of junction, yields ½ ton of ore per fathom. The same level south produces stones of ore. The 50, south of cross-cut, yields ¾ ton of ore per fathom. The same level north of cross-cut yields ½ ton. The 30 south is poor. The 30 north yields about ¾ ton per fathom. The 8 north yields ½ ton. The 8 south opens tribute ground. The same level south of No. 2 cross-cut yields 1½ ton, and this level north from the same point yields stones of ore. The adit south of Bontoux' shaft is in a large soft lode, easy for exploring, but unproductive. Our tribute pitches in this mine maintain their yield.—Surface: We have been short of masons for building the new laveries, but hope, nevertheless, to get all the walls finished by the 10th. Our samplings for the month are about 326 tons.

Cape Copper.—The superintendent (June 27) writes:—"I am happy to report that we have had one good rain, which lasted some 24 hours, but regret to add that the mortality amongst the oxen still continues, and that transport is nearly at a standstill." The mining and general reports will be dispatched, as usual, by the steamer leaving a fortnight later.

West Canada.—Capt. Plummer, July 16: Huron Copper Bay—Bray's Engine-Shaft: The 60 is improving; the lode is large, and is now carrying good ore, in a much improved matrix, and it is now hoped the lode will prove to be continuously productive to Palmer's shaft. The cross-cut south of Bray's is still being driven, but no lode or branch has been cut since the one first reported. We are beginning to think that the branch referred to will represent the Fire lode at this level, which shows a considerable falling off in size and quality. The lode in the stope over the 35, east of Bray's, shows well. The lode is from 10 to 12 feet wide, and yields upwards of 3 tons to the fathom. The stope west below the 35 is worth from 2½ to 3 tons, and is promising to continue at this rate. Palmer's winze, below the 50 fm. level, is going on well; the lode is not all being carried in the winze, and we cannot, therefore, say how wide it is, but I should set it down to be worth from 2 to 2½ tons of ore per fathom. The stope east below the 20 yields 4 tons per fathom; on the west, 2½ tons; and on east of Stephen's winze 2 tons per fathom.—Wellington: The lode in the 40, west of Crase's, has not improved. This level will shortly communicate with Thomas's winze, after which I would strongly advise the suspension of this part of the mine until better times. The lode in the stope east of Mitchell's shaft is worth 1¾ tons per fathom. The 36 east is now being crossed by a small dyke, which we believe will not have any injurious effect on the productiveness of the lode. The stope below this yields 2 tons per per fathom. The lode in Rows's shaft seems to improve gradually as we descend. The stope on the east of this is nearly completed to the dyke. The stepe west is worth 2 tons per fathom.—Bruce: The 40, east of Trial's shaft, improved very much in June month, and the improvement continued up to the present week. I am sorry to say, however, that it has greatly lessened in value within the last three days; unless it speedily improves, I would advise its being stopped.—Taylor's Shaft: The 12 east contains a wide lode; this level has been poor from the beginning, although never without a sufficient quantity of copper ore to encourage its going on. The level west is looking well, and will yield 2 tons per fathom. This part of the Bruce Mine is looking exceedingly promising, and I think should be pushed forward vigorously. I enclose with this the setting list, which explains itself. I think the quantity of ore dressed for last month is quite satisfactory, and I believe we shall dress a similar quantity for July. A boat has just arrived for copper, and there is another cargo waiting the arrival of the fifth boat, which ought to be here shortly. Surface operations ore going on well.

[For remainder of Foreign Mines, see this day's Journal.]

NEW STEAM AND COMPRESSED AIR-ENGINE.

Fig. 1.

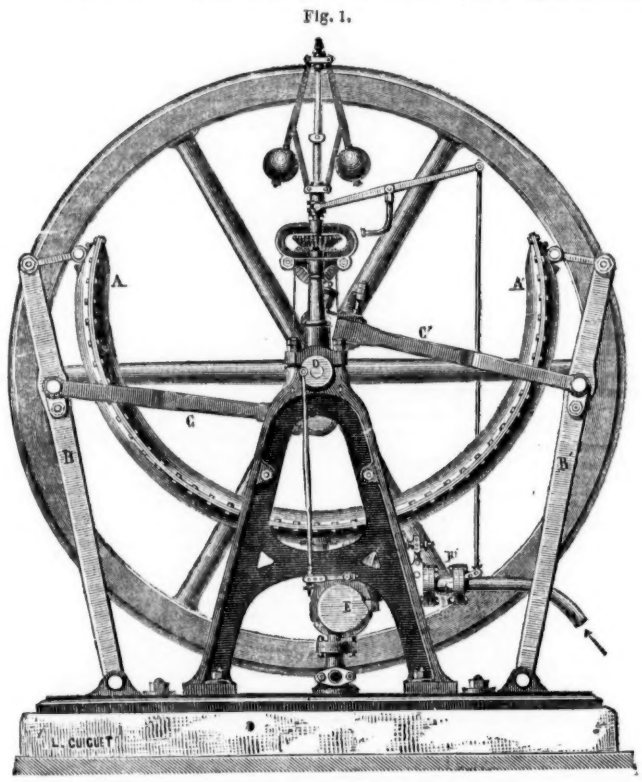
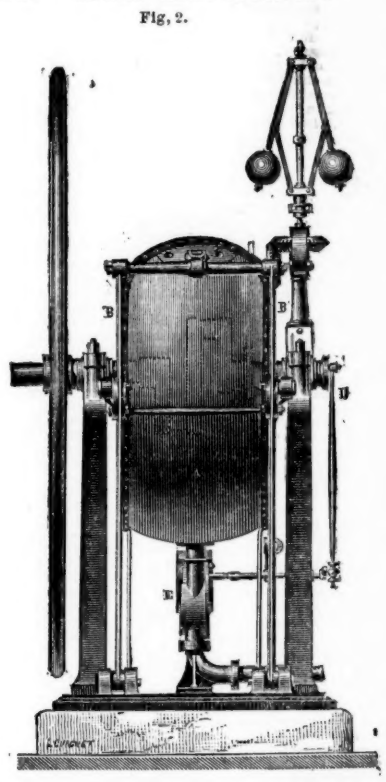


Fig. 2.



M. Eugene Bourdon, of rue du Faubourg du Temple, Paris, the originator of the metallic barometers and manometers, has lately invented a new steam or compressed air-engine, in which the usual cylinder and piston are replaced by a curved metallic tube. This tube, when steam or compressed air are introduced, has a tendency to straighten itself, and the two arms are forced asunder; as soon as the pressure is withdrawn, the curved tube by its own elasticity resumes its original form. This machine can also be set in motion either by atmospheric pressure or exhaustion. Fig. 1 represents the elevation of the contrivance. A A, the flexible tube; B B', arms connected with A A, and hinged at their lower extremities to the bedplate; C C', connecting-rods, which give a rotatory motion to the shaft, D, by means of two cranks diametrically opposite each other; E, is the valve-box, containing a valve of peculiar description, which we shall describe presently; F, is the throttle valve, for the regulation of the acting agent, either steam, compressed air, or a vacuum. Fig. 2 is an end view.

The elastic tube of thin steel or brass, A, is flat in section, and formed of two concave portions, united at their edges by bolts and thin steel bands applied all round the tube. This is the principal novel feature in the machine, replacing at once the piston and cylinder of ordinary motors, and the rapidity of its action is truly surprising. The models which we examined at M. Bourdon's establishment are set in movement by a partial vacuum, produced by a jet of water passing through a pipe, which has the effect of creating an exhaust. A pressure of only 25 inches of mercury is sufficient to set the engine at work. In the extension and contraction of a spring tube, the interior empty space of the tube has the inconvenience of greatly increasing the expenditure of steam, without producing as much useful effect as in an ordinary cylinder and piston engine. To remedy this, M. Bourdon fills the interior of the tube with a core similar to the tube itself, leaving only sufficient play for the approaching of their surfaces when the ends of the tube are brought together.

The distributor, E (Fig. 1), is formed of two tubes, like the valves of a cornet-à-piston, one inside the other, each furnished with two rows of round holes, so arranged that the outer tube communicates with the steam or air pipe, while the inner tube leads to the inside of the elastic tube, A, and acts as a slide-valve. When the inner tube is pressed down, communication is made between the lower row of holes and the steam-pipe, enabling the steam to pass into the elastic tube. When the sliding-tube is raised the supply is cut off, and the contents of the elastic tube escape, by the upper row of holes, into the air by a waste pipe or condenser. The advantages of this new machine are too obvious to be stated here; it works without friction or leakage, is extremely light—and, therefore, economical,—and its motion, even at its highest speed, unaccompanied by any trepidation.

M. Bourdon is also the inventor of a new water and steam cock, the opening or shutting of which is effected by the rolling of a strip of India-rubber, leather, or even cloth, over some 10 or 20 small holes. It is capable of resisting the highest pressure to which it would be practically subjected, and if the membrane should from any cause become injured it can be replaced at the cost of a few pence.

As to the effective power of the elastic tube engine, one is in course of erection on a scale that will permit the application of the dynamometer, and its force can then be ascertained. The details of the new steam-cock will form the subject of another communication.

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